



CONTINUING EDUCATION ON MASTITIS TESTING AND TREATMENT

KOSOVO CLUSTER AND BUSINESS SUPPORT PROJECT



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CONTINUING EDUCATION ON MASTITIS TESTING AND TREATMENT

THE REPORT ADDRESSES THE PROBLEM OF MASTITIS IN THE COWS OF KOSOVO AND THE CAUSES FOR THE WIDESPREAD INFECTION. IT PROVIDES RECOMMENDATIONS FOR MEASURES THAT MUST BE ADOPTED BY ALL INVOLVED IN THE DAIRY INDUSTRY – FARMERS, PROCESSORS, VETERINARIANS, EDUCATORS AND REGULATORS – IF THE HIGH INCIDENCE IS TO BE REDUCED.

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PURPOSE OF ASSIGNMENT

The Short-term Dairy Specialist will provide continuing education to commercial dairy farmers, veterinarians & artificial insemination (AI) technicians, specifically on mastitis testing and treatment. The specialist will work through the University of Pristina with model local farmers and the Milk Production Improvement Program (MPIP) implemented by the KCBS subcontractor, BIOLAB.

BACKGROUND

The KCBS survey conducted on dairy cows in Kosovo this summer showed that over 75% had mastitis. Mastitis is a serious problem, because it decreases milk yield up to 25% and reduces the quality of the milk. The vast majority of farmers are unaware that their cows have this infection, even though mastitis cuts into most of their profit. The veterinarians and farmers who have expressed concern are qualified to treat only clinical cases of mastitis. They are not aware that sub-clinical (physically undetectable) mastitis is affecting the profitability of their herds. Increased mastitis infection can be expected with increased milk production unless all lactating cows are tested at least monthly and treated during the dry period.

Mastitis control is a problem for the entire dairy industry in Kosovo. Consumers demand high quality products that have a long shelf life, good flavor, and are perceived to be a safe wholesome food. Without consumer demand there will be no need for dairy farmers or processors to continue their operations. The milk processor can not improve the quality of the milk once it leaves the farm. High quality milk being received into the plant, with the exception of fluid milk, generates more processed product (cheese, jogert, ice cream) per 100 kilograms of milk and will have a good flavor, and have a long shelf life. Without these qualities in the local dairy products, they will be unable to compete in the market place. Farmers also have a responsibility in providing high quality milk to the processor. The farmer must provide a good environment for the cows, harvest the milk properly, keep the milk cool, and monitor the herd for bacteria and Somatic Cells in the milk. If farmsteads are kept neat in appearance, cows are kept clean, and housed in good facilities, then the consumer perceives the dairy products as being safe. The public health department also has a responsibility in monitoring the performance of all sectors in the dairy industry by setting standards of safety for handling the milk, housing the cows, harvesting equipment, and standards for processed products. Mastitis control is not only a farmer issue, but is an issue that reaches across all sectors of the dairy supply chain.

In 1959 the consumption of dairy products was declining. The industry had problems with milk quality, even though the Pasteurized Milk Ordinance (PMO) had been passed and was being administered by the public health agencies throughout the United States. Issues that plagued the industry were low product yield making dairy products expensive to buy, short shelf life, inconsistent taste, and a perception by consumers that dairy products were not safe because of the image of the dairy farm. At that same time the milk production per cow was 3500 kg of milk per 305 day lactation, and 25% of the cows in the United States had mastitis and were producing milk with a high Somatic Cell Count (SCC). There had been a considerable amount of research on the problem completed, yet the information was fragmented and every one had a different idea about the problem. The result was farmers did little to reduce the mastitis problem. In 1960 an organization known as the National Mastitis Council (NMC) was formed. This organization reached across all segments of the

dairy industry and included representatives of universities, research institutions, marketing groups, processors, milking equipment manufacturers, feed and supply companies, public health officials, breed association, farmers, extension advisors, and even the press. Once the information was consolidated and everyone started “singing from the same song book” and when processors started making farmers aware of the problem, milk quality improved. The changes did not come quickly, however in 1999, 40 years after the inception of the NMC the dairy cows in the United States produced over 9500 kg of milk in a 305 day lactation while only 8% of the cows were infected with mastitis. As a result of this cooperation within the industry the consumption of dairy products is at an all time high (per capita) and continues to rise. The consumers recognize dairy products as a safe product that offers value for the money they spend. The dairy industry in Kosovo will be viable, competitive, and have a significant market share only if the farmers, processors, and supporting industries are willing to adopt measures to improve the quality of milk.

It is important to remember the issue of bacteria counts and Somatic Cell Counts go hand in hand. Sustained high levels of bacteria indicate poor hygienic conditions for the dairy cow and poor sanitation on the farm are the leading factors in the development of mastitis. Therefore it is important not only to address the issue of Somatic Cells Counts and mastitis control, but bacteria counts must also be considered in the formula.

As dairy farms in Kosovo grow and develop, and as economic incentives are provided by the processors, farmers will be more willing to adopt practices that are conducive to the control of mastitis. Farmers must be aware of the problem and have a desire to correct the problem before the SCC in milk will be reduced. They must also have a good understanding of the dynamics of the problem and understand the impact high SCC has not only on their profitability, but also on the entire industry. My task in this visit is to prepare materials for use in educating farmers, observing some of the work now being done, and provide the recommendations that can be beneficial in developing an effective program for mastitis control in Kosovo.

EXECUTIVE SUMMARY

Mastitis, an infection of the mammary glands, is the result of microorganisms entering the udder. Mastitis is the world's greatest problem in the dairy industry. It has been estimated the annual cost for mastitis is \$180.00 per cow per year. The factors that contribute to mastitis are the same in all countries in the world; therefore the same control programs will work every place in the world. Mastitis control is not just a "farmer issue", but rather a task that everyone in the industry must address and constantly be aware of. This means the processors must have testing facilities to monitor the Somatic Cell Count (SCC) in milk arriving at the processing facility. The SCC must be determined for each supplier problem cases can quickly be identified. Farmers must be made aware of their counts very frequently so they can address any increase quickly. Most of all, everyone in the industry must be talking about the issue, and when developing control programs it is important everyone "sing from the same song book". Mixed messages or conflicting recommendations often lead to inaction by the farmers and mastitis problems do not disappear. The greatest motivator for achieving mastitis control will be for the processors to provide economic incentive to farmers to reduce the SCC in their milk. Currently only one known processor is paying an incentive on bacteria counts in the milk, but is not even testing for SCC.

Mastitis control in the herd is achieved by the actions of the farmer and his employees. To reduce the mastitis in a herd, the farmer must apply good management practices, house the cows correctly, follow a planned breeding program selecting sires that will correct trait problems in his cows, and insure his milking equipment is functional and well maintained.

At this point would be very difficult to determine if most of the mastitis in Kosovo is environmental or contagious. The only sure way to determine the causes is by doing a microbiological culture palate and actually looking for the different species of microorganisms. I was not able to find any one that knew their SCC or what types of microorganisms were causing the problem. Until creditable laboratories are established and culture plates are processed, the types of mastitis in the country will be unknown.

Prevention is the key to reducing the mastitis in the herd. If only the infected cows are treated, and no steps towards prevention are taken, there will be little or no reduction in the amount of mastitis in the herd. The National Mastitis Council in the U.S. has developed a six step prevention program that can be followed by farmers. If this prevention program is adopted on the farm and followed closely, the rate and duration of mastitis will be much less. It works in large herds, herds housed in traditional barns, herds in free stall barns, herds on pasture and in all breeds of cattle. If Kosovo farmers adopt this control program, along with some improvements in management, the result will be less mastitis in their herds.

There are many challenges that plague the dairy industry in Kosovo. Many of the cows have genetic traits that contribute to mastitis; therefore the farmer must embrace a sound breeding program using proven bulls to improve his future herd. The housing is less than desirable for the herds. The barns are warm, humid and have very poor air quality. This is an ideal environment for the growth of microorganisms that contribute to environmental mastitis.

Improved milk quality depends on a number of factors. Firstly, the farmers must recognize the problem and be willing to address the problem. Veterinarians must work closely with the farmer to determine the microorganisms that are contributing to the mastitis problem, and train the farmer in prevention. Milk processors must start determining the SCC on raw milk from each farm on a regular basis, usually at intervals of no more than one week. The Institute of Public Health must develop a set of standards for cow sheds, milking equipment, and the acceptable limits of bacteria and SCC in milk. Teamwork is essential if mastitis is to be controlled in the country.

During my stay, the following activities were conducted in support of the development of materials and recommendations for the development of an educational program for mastitis control.

- Visited several farms to gather information on cow keeping practices and make an assessment of mastitis problem on farms.
- Observed the current training program that is being used to educate farmers about milk quality. BIOLAB, a contractor to KCBS is providing the training.
- Contacted the Institute of Public Health to find out what milk quality work is currently being done.
- Visited a milk processor to find out how they were determining milk quality, payment plans, and to find out about SCC in milk.
- Conducted a Training Seminar for veterinarians and farmers to create an interest in mastitis control programs.
- Developed training materials that were appropriate for use by local veterinarians and others who wish to work on milk quality.
- Observed the milk pick up practices of the milk haulers.
- Evaluated the current system and prepared a list of steps to take to improve the milk quality in Kosovo.

Based the SCC scores that I was able to determine using the PortaCheck® Electronic Somatic Cell Counter, my observations would lead me to believe there is some mastitis in the herds, but not nearly as much as originally thought. The scores ranged from 220,000 scc/ml to 440,000 ssc/ml. Most likely there are more yeast infections due to the high bacteria in the environment. Without a larger sampling it would be inaccurate to completely draw this conclusion, but if widespread testing becomes available and SCC scores are low, then yeast may be the problem.

An effective mastitis control program can be developed, however it will take a considerable amount of time and effort. The key will be to get cooperation and teamwork from processors, regulators, veterinarians, educators, and farmers.

FIELD ACTIVITIES TO ACHIEVE PURPOSES

The assignment for this trip to Kosovo was to develop a continuing education course that could be used to train veterinarians, commercial farmers, and milk processors on how to control mastitis in dairy herds. The material I developed can be used either for creating and awareness of the problem, or for treatment of specific pathogens that cause mastitis.

During my time in Kosovo, I visited several farms and observed the conditions of the farm as well as milk harvesting practices, milk storage practices, and sanitation of the milking equipment on the farm. I also conducted some Somatic Cell Counts on farms using the PortaCheck® Electronic Somatic Cell Counter. Ironically the farms I tested had relatively good SCC scores, and this would lead me to believe the problem of mastitis may not be as great as earlier thought. The score on the farms would indicate the issue may be yeast infections in cows and not traditional mastitis.

I did observe the sampling procedure that milk haulers were using to collect the sample for laboratory analysis to determine the quality of the milk being provided from the farm.

Time was spent with BIOLAB to observe their technique of training farmers. The session I attended had seven farmers present and was conducted at an evening milking. I also attended a follow up training program BIOLAB held at another farm the next morning. The information they are providing was accurate but most of the program focused on bacteria in milk. They did, however, demonstrate how to use the California Mastitis Test (CMT) as a tool to identify suspect cows.

A visit was made to the Institute of Public Health Lab; however I was not able to speak with the person responsible for milk testing programs. Most of the work being done by the laboratory was to confirm the quality of finished products. They have had some contact with officials from Denmark about implementing a raw milk testing program, but the work would be for bacteria counts and not Somatic Cell Counts.

One milk processor was contacted to find out what was being done as far as testing to determine the quality of the raw milk. The milk plant was using an alcohol test to determine the level of bacteria. One time per month they are doing a plate culture to find out what microorganisms were present. The interesting point is they specifically mentioned finding *Staphylococcus aureus* in some of the samples. This would indicate some of the cows are carrying contagious mastitis and cure is highly unlikely.

A seminar for dairy farmers, veterinarians, and the BIOLAB staff was conducted. The purpose of the seminar was to introduce the participants to the fundamentals of mastitis control, identification of the microorganisms, and proper treatment procedures. A condensed version of the training module was presented due to time constraints, however several participants did obtain an electronic copy of the full program (in the Albanian language) on memory sticks. KCBS will have a copy of the course available for anyone who would like to take the program to their clients. A list of the participants was provided to KCBS for their records and so they could follow up with the participants with information on future activities.

A summary report of my observations and recommendations for future activities were reviewed in a briefing with Martin Wood, Chief of Party, KCBS, and Arben Musliu, Milk Production Program Specialist.

TASK FINDINGS AND RECOMMENDATIONS

1. Contributing Factors to the Problem

Numerous studies have been done on the reasons why a farm has a mastitis problem. The studies indicate there are four contributing factors. These factors are:

- **Using Milking Machines that are not Functional:** On **6%** of the farms that were in the study, it was found the farmer was milking his cows with machines that were not correctly designed or correctly installed in the case of pipeline systems or parlors. My observation in Kosovo is the machines being used to milk the cows are functional, however they are not maintained.
- **Genetic Traits in the cows:** There is not one specific gene that determines the susceptibility to mastitis. Traits such as large teats, poorly attached udders, and weak sphincter muscles allow the cow to be more susceptible to mastitis. Genetic traits contribute to **20%** of the mastitis problems. Type improvement must be a priority in the selection of sires in the future.
- **Housing and Environment of the cow:** Cows that are housed in barns that do not have good ventilation, are incorrectly designed for the resting area, and not clean and dry contribute significantly to the amount of environmental mastitis that exists in herds. This factor accounts for **25%** of the mastitis in problem herds.
- **Management and Milking Practices of the farm:** How the cow is milked and managed is the major contributing factor in high SCC herds. Poor management contributes to **49%** of the mastitis.

2. Forms of Mastitis

Mastitis, an infection of the mammary glands, is the result of microorganisms entering the udder. When this occurs the number of white blood cells (Leukocytes) increase in an effort to isolate and kill the intruding microorganisms. The microorganisms are generally the result of the teat end being exposed to bacteria in the environment, on milking equipment, on the hands of the people milking the cows, or in dirty cleaning of the cows. There are two forms of mastitis. They are:

- **Environmental Microorganisms (*Streptococci* or *Coliforms*):** These microorganisms live in the environment. Keeping cows in conditions that are not hygienic will result in environmental mastitis. Environmental mastitis can enter the herd quickly but can also be eliminated from the herd quickly.
- **Contagious Mastitis (*Streptococci Aureus*, *Staphylococcus Agalactiae*, or *Microplazma Bovis*):** These microorganisms live in the cow, usually in the udder but in some cases in the reproductive tract of the animal. Contagious mastitis is very hard to eliminate from the herd, especially *Streptococci Aureus* and *Microplazma Bovis*. If this microorganism is found, usually the cows must be culled from the herd. The method by which these microorganisms enter the herd is through newly purchased animals from infected herds. Contagious mastitis is characterized in the herd by a relatively few clinical cases of mastitis, but a very high “bulk tank SCC”. The effective cure rate for animals with this pathogen is very low and the animals usually must be culled from the herd.

3. Severity of Infection

Mastitis is further characterized by defining the severity of the infection. The most recognized type of mastitis is clinical. However, the rate of subclinical mastitis is 15 to 40 times greater than the clinical cases; therefore often when talking to farmers they do not think of the subclinical mastitis in the herd.

The normal SCC is 200,000 scc/ml of milk, however the cow is not considered to be infected until the count rises to 300,000 scc/ml of milk. Each time the count raises by 100,000 scc/ml of milk, the loss of milk production is 2.5% per lactation. For example, a herd has a cell count of 400,000 scc/ml the loss of milk due to mastitis would be 5%. This is the reason SCC information is so important to the farmer. At the same time as the SCC increases, the yield of processed products such as jogert and cheese will decline by 1%. Reducing SCC is of benefit not only to the farmer, but to the processor as well.

4. Prevention

Prevention is the key to reducing the mastitis in the herd. If only the infected cows are treated, and no steps towards prevention are taken, there will be little or no reduction in the amount of mastitis in the herd. The National Mastitis Council in the U.S. has developed a six step prevention program that can be followed by farmers. If this prevention program is adopted on the farm and followed closely, the rate and duration of mastitis will be much less. The steps in the program are:

- 1. Use good milking hygiene.** Milk cows that are clean and dry, and that have been screened by fore stripping milk to detect any mastitis.
- 2. Use only milking machines that are functional and in good repair.** Failure to have a milking system that is designed correctly and maintained will result in cross contamination of cows and this leads to mastitis.
- 3. Dip the teats with a disinfectant before and after milking.** Dipping the teats before milking will kill any microorganisms that might be missed in the cleaning process. Dipping the teats after milking kills the bacteria that may be on the teat as a result of the milking process.
- 4. Treat all cows at drying off time.** Most of the new mastitis infections in cows start during the dry period and are undetected until after calving time. Dry cow treatment programs are a must in order to reduce the mastitis in a herd.
- 5. Treat all clinical cases of mastitis and confirmed cases of contagious mastitis.** It is important to promptly treat all clinical cases of mastitis. If a problem exists with contagious mastitis, then cows that are infected should be treated as well, even if they do not show the signs of clinical mastitis. Follow the label instructions and withhold milk for the prescribed length of time.
- 6. Cull cows with chronic mastitis.** Each time a cow has mastitis, scar tissue forms in the udder, making treatment less effective. The antibiotic is not less effective against the microorganism, but rather the scar tissue provides a hiding place for the microorganisms and treatment becomes less and less effective. Cows with chronic mastitis pose a risk to other cows in the herd.

5. Review of Tasks in the Scope of Work:

5.1 Prepare the continuing education course outline using the Mastitis Testing and Care Guide developed by KCBS consultants.

During my stay in Kosovo I reviewed past material; then, based on experience gained in implementing milk quality programs in many other countries, I added a considerable amount of material to the package. A revised course outline was developed (Annex 1) to provide more detail and information about new practices. The outline discusses:

- the reasons for milk quality,
- bacteria and its relationship to mastitis,
- the development of a mastitis control program,
- procedures for the collection of milk samples from the bulk tank and from individual cows,

- correct treatment procedures, and
- the process for treating environmental and contagious mastitis.

A Power Point presentation consisting of 185 slides was also prepared. The Power Point does contain the narrative for the presentation in the notes section of each slide. The presentation can be presented in full or by section.

5.2 Reproduce the continuing education course outline along with the Mastitis Testing and Care Guidelines for presentation to five farmers and the BIOLAB staff.

I provided both hard copies and electronic copies of all material to the KCBS staff. A presentation was made to the BIOLAB staff as well as several other participants while observing the work of BIOLAB.

5.3 Present five separate trainings to veterinarians, AI technicians, and dairymen.

A major seminar program was presented to veterinarians, dairymen, and other industry professionals. The seminar was well accepted by those who attended the seminar and several electronic copies of the presentation were requested. Those in attendance at the seminar included some of the key leaders in the government and educational fields. The BIOLAB staff was at the meeting as well.

CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE ACTIVITY

The future competitiveness and success of the dairy industry depends largely on the ability of the Kosovo dairy farmer to produce a high quality raw material the processors can use to generate a high quality product. The ability to adopt new technology and to implement the practices that generate high quality raw material is a must for survival of the industry. The challenge is the production of high quality raw milk depends on many factors and on the cooperation of all of the components in the industry. Farmers will be reluctant to “go the extra mile” to produce a high quality product unless there is an economic reward. Processors must be interested in producing a product that is desirable and affordable by the consumers of Kosovo. The government must be willing to set standards and regulations that will result in a product that is safer or at least perceived safe by the customer. **Therefore the first step in achieving the goal of milk with a low SCC is to get everyone on board, “singing the same song from the same song book” and constantly working toward improved milk quality.**

The issue of mastitis control and bacteria go hand in hand. The microorganisms that cause the bacteria problems in milk are the same culprits that lead to mastitis in the herd. A farm that has a very low Total Plate Count (TPC) or Standard Plate Count (SPC) will have a very low rate of mastitis on the farm. Farms that have a high TPC or SPC will also encounter mastitis problems. One of the major problems in Kosovo is the facilities in which the cows are housed. The problems are:

- Cows are currently housed in barns that lack good ventilation. The levels of ammonia will be very high in the barn, as well as the humidity levels. This, coupled with heat, provides an excellent place for bacteria or microorganism growth. To correct this problem the windows should be open even in the winter as well as fans installed to insure plenty of clean fresh air.
- The cows are kept in the barn around the clock. The resting area of the cow is often covered with straw. On the surface the straw looks dry, but close examination will reveal moisture and decaying straw. This again provides the opportunity for microorganism growth. Cows should be turned out of the barn every day and the bedding should be completely removed. The resting area should have some time to dry before the cows return.
- The cows in the barns have manure caked in the hair around the flank and leg area. This is a place that will harbor bacteria that can lead to high bacteria counts and mastitis problems. Cow cleanliness is a key to reducing environmental mastitis in the herd.
- Lactating cows and dry cows are often kept in the same area of the barn. Since new cases of mastitis are likely to start during the dry period it is important the dry cows be housed in the cleanest environment on the farm. Housing dry cows in a clean environment and allowing them to calve in a clean environment will not only reduce the mastitis, but will also reduce the early lactation problems with metritis and other reproduction related diseases.
- Milk harvesting equipment is often not cleaned well, the deposits of milk fat and protein in the equipment only feeds bacteria, resulting in contaminated equipment being used to harvest the milk.
- All of the milk harvesting machines I observed was in need of repair, especially the rubber parts. The result of milking machines that need repair is the bacteria are injected into the udder causing mastitis.

It is imperative that every consultant and everyone that visits the farms to talk about dairy production problems emphasizes the need for keeping cows in a clean, dry,

comfortable environment. A poor environment leads to a high rate of environmental mastitis in the herd as well as high bacteria counts in the milk. **Inadequate housing also leads to reduced performance of the cow in terms of milk production and reproduction efficiency as well.**

Although there is currently a lot of emphasis being placed on bacteria in milk, the testing procedures for bacteria are inadequate. Currently, the processors are using Alcohol Stability Test, Titratable Acidity Test, and Methylene Blue Test to determine bacteria in the milk, however these tests only indicate bacterial activity and are an indicator high levels of bacteria are present. A system of accurately determining the actual levels of bacteria in the milk must be established. Milk processors must be willing to establish the necessary laboratories and provide the information to the farmer on every pick up of milk. An accurate laboratory test (SPC or TPC) is the only accurate method of determining the levels of bacteria. Currently I am hearing bacteria counts ranging from 70,000 to 5,000,000 and this level of bacteria will definitely contribute to mastitis. Farmers and processors should be striving to reach a goal of 10,000 or less. This goal is achievable, even in the conditions that exist in Kosovo, but farmers must be made aware of the actual counts and have confidence the information they are getting is accurate and correct. It is imperative that outdated methods of determining the quality of milk based on outdated tests be changed. **A milk quality laboratory that uses modern methods must be established as quickly as possible.**

I did observe the training being provided to farmers by BIOLAB on two occasions. The information they are providing to the farmer in relation to good cow milking practices and the sanitation of the equipment is basically correct. When they make their presentation they do talk briefly about the environmental conditions of the cow and the impact of the environment on the bacteria in milk. They also do a mastitis screening demonstration using the California Mastitis Test (CMT). They are making the farmer aware of subclinical mastitis and this is a step in the right direction. I also visited a veterinary clinic to find out how they screen cows and what test procedures they were using. The veterinarian I visited with was using the CMT as well, and was not actually culturing any of the milk to find out what types of microorganisms are in the milk. To develop accurate prevention and treatment programs, the actual number of SCC in the milk and the species of microorganisms must be known. Until these two parameters are known, the amount of mastitis and the scope of the mastitis problem is not known. **Obtaining the count is possible and is relatively affordable by using a portable electronic cell counter and doing a cell count on the farm. These tests are relatively accurate and are affordable. I would recommend BIOLAB expand their program to include providing the farmers they work with an actual SCC number.**

I would also recommend a suitable microbiology lab that can grow the culture plates and identify the mastitis microorganisms be identified and contracted to provide information on the types of mastitis that are in existence in the country. The laboratory should follow the procedures established for culturing milk, identification of the microorganisms, and the classifications of the mastitis types in accordance with the standards and recommendations of the NMC.

The problem of milk quality goes beyond the farm operator. Processors must employ reliable and responsible haulers that understand the proper procedure for obtaining a milk sample, handling the sample, and adhering to good sanitation rules. I had the opportunity to observe one milk pick up at the farm, and I would have to assume the same practices are being followed by other haulers as well. The hauler I observed committed the following errors in sampling and loading the milk.

- The milk temperature was not taken prior to loading the milk. On this farm, I did check the temperature and it was 10°C which means there will be a considerable amount of bacteria growth in the milk before it reaches the plant.

- The technician that took the sample did not wash his hands prior to collecting the sample. Neither was the sampling equipment sanitized before starting.
- The sample was placed in a large plastic juice bottle and was placed in an insulated cooler with no ice or water. The sample should be in a small sterile sample jar (50 – 60 cc) or a “Whirl-pac®” sample bag. The sample should then be placed in an insulated cooler with ice water. This will keep the sample cold and will not allow bacteria growth between the farm and the plant.
- When the loading process began, instead of using the valve on the bottom of the tank to connect the intake hose to, the top of the tank was opened and the hose dropped into the milk. Any contaminants that have been picked up while driving the truck from the previous stop will be in the milk load.
- While loading the milk the employee was smoking a cigarette over the open tank. Certainly this is not an acceptable practice.
- The intake hose on the truck was not equipped with an end cap or plug to prevent road grit or dust from entering the hose between stops.

The employees of the milk processing plants must be trained and must follow good sanitation procedures if high quality products are to reach the consumer.

It is important the educational process continues not only through the local programs but through programs such as the USDA Cochran Program and World Learning. Programs offered by these organizations afford some of the leaders of the dairy industry to have the opportunity to see first hand what can be achieved by cooperation within the industry. They also have the opportunity to strengthen ties with leaders in America, or other countries that can offer them advice and assistance as they move forward. It also affords the participants to make some contacts with potential suppliers in other countries. Continuing education in all aspects of the dairy industry is the key to improved production, competitiveness, and profitability.

While at KCBS, even though it was not part of my SOW, I did assist Martin Woods in the development of concrete plans for the introduction of US Genetics to the farmers of Kosovo. This no doubt will build the self esteem of the farmers that have the opportunity to improved genetics as a tool for improving their operations. The attitude and the concerns about the performance of US genetics would not have been as positive as it is without the support of USDA via the Cochran Fellowship Program and the World Learning Dairy Management Program.

One last comment. The work KCBS is doing to promote the dairy industry is accomplishing the goals of creating a viable and competitive industry. Certainly many of the people who are keeping cows today will not be in the dairy business five years from now. The work must focus on educating the farmers who are most likely to be in business in the future and who will “grow their herd”. This task of training is tremendous and will take much time and effort not only from KCBS but from everyone in the agricultural sector. A golden opportunity exists to share information and to “spread the word” of the consultant by including local extension, educators, and KAMP in the farm visits. Consultants should be used to “train the trainer” so the information is shared as widely as possible.

ANNEXES

Annex I	Mastitis Control – A Course Outline
Annex II	Let's Talk About Milk Quality, A Power Point Presentation
Annex III	A Farmers Guide to Controlling Mastitis
Annex IV	Procedures for Good Cow Milking
Annex V	Sanitizing Milking Utensils
Annex VI	Harvesting Milk By Hand & Cleaning Utensils

ANNEX I:

Mastitis Control- A Course Outline

Mastitis Control & Milk Quality

Continuing Education Course for Improved Milk Quality

KCBS-Kosovo

November – December, 2005

Lindell Whitelock

Consultant

1. *Why is Milk Quality Important?*

- a. Consumers demand high quality dairy products.
 - i. Flavor is important.
 - ii. Long shelf life to get the maximum benefit of money spent.
 - iii. Product that is perceived to be safe.
- b. Milk Quality determines the product yield of processed products.
 - i. High bacteria counts impacts product.
 - 1. Shelf life.
 - 2. Taste.
 - ii. Somatic Cell Counts (Indicators of Mastitis)
 - 1. Significantly changes the composition of the milk.
 - 2. Reduces Product yield.
 - 3. Flavor and quality of the processed product is impacted.
- c. Milk Quality depends on the farmer.
 - i. Milk Quality can not be improved after it leaves the farm.
 - ii. The final product quality is largely dependent on the quality of milk provided by the farmer to the processor.
- d. The Goal of the Dairy Industry: Provide Customers with Dairy Products of the Highest Quality.

2. *Who Benefits from Improved Milk Quality?*

- a. Consumers benefit because of....
 - i. Improved shelf life
 - ii. Improved taste
 - iii. Confidence they are getting a safe product.
 - iv. Thus they will purchase more local dairy products.
- b. Processors benefit because of
 - i. Higher processed yields per 100 kg of milk.
 - ii. Longer shelf life, less spoilage in the distribution chain.
 - iii. Ability to process a product that tastes the same every time.
- c. Farmers benefit because of....
 - i. Greater demand for dairy products resulting in higher farm income.
 - ii. Improved milk production from the cows.
- d. Thus everyone wins with improved milk quality.

3. *High Quality Milk...*

- a. Has a low Standard Plate Count.
 - i. Has a Low Psychrophile Bacteria Count.
- b. Has a Low Somatic Cell Count.
 - i. 200,000 SCC or Less per ML.
- c. Contains No Inhibitors or adulterants.

- d. Is stored at cold temperatures from the farm to consumption.

4. High Quality Milk...

- a. Should not contain added water or cleaning chemicals.
- b. Should not contain antibiotics.
- c. Should be filtered and clean filters used at each milking.
- d. Should be cooled quickly after harvesting.
- e. Should be kept cold during transport to the farm.

5. High Quality Finished Dairy Products....

- a. Start with High Quality raw milk.
- b. Are pasteurized properly.
- c. Are not contaminated post pasteurization.
- d. Stored at cold temperatures.
 - i. Kept cold at the processing plant.
 - ii. Kept cold during transport.
 - iii. Kept cold at the market.
 - iv. Kept cold at the consumer's home.

6. Milk Quality is affected by....

- a. Dirty cows .
- b. Improperly cleaned wash cloths.
- c. Unsanitary water.
- d. Colostrum in the milk.
- e. Frozen milk.
- f. Improperly cleaned equipment.
- g. Mastitis in the cows.
- h. The material presented in this course can be applied to large modern milking facilities or to herds milked in traditional ways.

7. Bacteria Counts...

- a. Can change quickly in milk, but are easy to detect and correct.
 - i. The type of bacteria in the milk indicates where the problem is.
- b. Equipment that is not properly cleaned.
 - i. Follow good cleaning procedures.
 - ii. Use the correct cleaning products.
 - iii. Allow equipment to air dry between milkings.
- c. Milking wet dirty cows.
 - i. Establish a good cleaning routine.
 - ii. Be sure cows are dry before milking.
 - iii. Use individual paper or cloth towels for each cow.
- d. Not cooling milk quickly after milking.
 - i. Milk should be cooled to +4°C within two hours after milking.
 - ii. Milk temperature must be maintained at that level until processing.

8. Bacteria Counts are Reduced by....

- a. Milking cows that are clean and dry.
- b. Provide the cow with a clean environment.
- c. Cool milk quickly.
- d. Insure milking equipment is properly cleaned.

9. Mastitis (Somatic Cell Counts) Reduces Milk Quality....

- a. Mastitis is a world wide problem, and is the most expensive disease in dairy cattle.

- b. The causes of Mastitis are the same everywhere in the world, the controls are the same.
- c. Subclinical mastitis causes production and financial losses.
 - i. For each increase of 100,000 SCC/ml production is reduced by 2.5%.
 - ii. For every clinical case of mastitis there will be 15 to 40 subclinical cases.
- d. Improper management and care are the main contributing factors for mastitis in cows.
 - i. Milking contributes to 6% of the cases of mastitis.
 - ii. Genetics or undesirable traits in cows contribute to 20%.
 - iii. Housing and Environment contribute 25%
 - iv. Management and Milking Procedures contribute 49% of the cases.
- e. Cows with a SCC >300,000 probably have a mastitis infection.
- f. **The key to Mastitis Control is Prevention.**

10. Understanding Mastitis and the SCC score...

- a. Contagious Mastitis presents the greatest challenge.
 - i. *Streptococcus agalactiae*.
 - ii. *Staphylococcus aureus*.
- b. Environmental pathogens are prevalent but easy to control.
 - i. Streptococci
 - ii. Coliforms
 - iii. Other infections.
- c. Must use laboratory cultures to determine the microorganisms in the herd.
- d. Use good identification procedures including cow side test to detect new cases.
- e. The Bulk Tank SCC and the Number of Cases of Clinical Mastitis are an indicator of the type of Mastitis.
- f. To reduce the SCC in a herd both the number of cases and the duration of the problem must be reduced.

11. Developing a Mastitis Control Program....

- a. Use excellent milking hygiene.
- b. Use functional milking machines correctly.
- c. Dip teats with a disinfectant before and after milking.
- d. Treat every quarter of every cow at drying off time.
 - i. Most new infections occur during the dry period.
- e. Treat all clinical cases of mastitis.
 - i. Cows identified with contagious mastitis should be treated even if the mastitis is not clinical.
- f. Cull cows with chronic mastitis.
- g. Mastitis Control Programs are effective in..
 - i. Large herds.
 - ii. Herds housed in traditional barns.
 - iii. Herds that are kept in free stalls.
 - iv. Herds kept on pasture.
 - v. All breeds of cattle.
 - vi. Herds milked by hand.

12. Good Cow Milking Procedure is a Key to Bacteria and Somatic Cell Count Reduction.

- a. Always check for clinical mastitis.
- b. Milk Teats that are Clean & Dry.
 - i. Use minimal amount of water to wash, and dry with individual towel.

- ii. Pre dip to reduce environmental mastitis. Remove pre dip with an individual towel.
- c. Attach the teat cups of the claw properly.
 - i. Avoid air leaks that allow the teat cup to slip on the teat.
 - ii. Use hose supports to reduce liner slip.
- d. Shut off vacuum to the claw and allow the unit to slip off easily. Never remove the claw under vacuum.
- e. Dip Teats after milking.
- f. At the end of the milking period inspect the milk filter. Look for contaminants and signs of mastitis.

13. Control of Environmental Mastitis...

- a. Environmental Organisms include
 - i. Streptococcus Uberis (Most Common)
 - ii. Coliforms such as Escherichia Coli, Klebsiella, Citrobacter.
- b. Streptococcus Uberis and Strep Dysgalactiae are controlled largely by good milking hygiene.
- c. To control environmental mastitis:
 - i. Keep the environment as Hygienic as possible.
 - ii. Provide dry cows with a clean environment.
 - iii. Insure cows have a clean place for calving.
 - iv. Use a pre dip program.
 - v. Keep cows standing for 1 hour after milking.
 - vi. Treat every quarter of every cow at drying off time.

14. Eradication of Contagious Mastitis from the herd.

- a. Contagious Mastitis is spread from cow to cow via milker's hands or other equipment. Milking Hygiene is the key to reducing the risk of spreading from one cow to the next.
- b. Culture a bulk tank sample to determine the presence of contagious mastitis in the herd.
- c. Prior to starting an eradication program insure good milking procedures are being followed on the farm.
- d. Use records to identify suspect cows.
- e. Collect milk from suspect cows and have a microbiology culture test completed on each of the samples in a laboratory that specialized in milk testing.
 - i. Sanitize the teat end using alcohol.
 - ii. Use sterile sample tubes to collect the milk samples in. Be sure not to contaminate the tube during collection.
 - iii. Place collected milk samples in an ice chest with ice water to insure the samples are kept cold until testing
 - iv. Have the milk tested in a laboratory that specializes in the testing of milk.
 - v. Summarize the laboratory data.
- f. Segregate the infected cows.
- g. To control ***Streptococcus agalactiae*** the following steps should be taken.
 - i. Treat the infected cows with Penicillin for two successive milkings.
 - ii. Be sure and follow label directions and discard milk for the specified time.
 - iii. Collect milk samples from infected cows 14 to 21 days after treatment.
 - iv. Collect a bulk tank sample to insure there are no new cases in the herd.

- v. Cows that did not respond to the first treatment treat with the maximum number o treatments recommended by the manufacturer.
- vi. Collect samples from the cows 14 to 21 days after treatment to confirm response.
- vii. Cows that fail to respond to the second treatment must be culled from the herd.
- viii. Analyze samples of milk weekly to determine if the problem reappears in the herd.
- h. To control ***Staphylococcus Aureus*** the following steps should be taken.
 - i. The microorganism is spread during milking so milking hygiene must be followed closely.
 - ii. Lactation therapy generally does not eliminate the infection.
 - iii. Treat each quarter at drying off. The cure rate during the dry period is much greater than in lactation.
 - iv. Staphylococcus Aureus is usually harbored in scar tissue making treatment difficult.
 - v. Combination therapy (Intramuscular injection and intra mammary infusion) will achieve the highest cure rate.
 - vi. Pregnant heifers should be vaccinated if the herd has Staphylococcus Aureus.

15. Following Correct Treatment Procedures is essential to prevent fungus or yeast infections...

- a. Milk the cow out completely and dip the teat.
- b. Use an alcohol pad or cotton pad treated with a disinfectant to clean the teat end.
- c. Insert the treatment tube only 3mm into the teat end.
- d. Infuse the antibiotic into the teat canal.
- e. Dip the teat.
- f. Mark the cow so the milk can be discarded in accordance with the manufactures recommendation.

16. Let's Review What We Have Learned...

- a. Bacteria counts are easy to control. They are caused by:
 - i. Dirty milking equipment.
 - ii. Slow or poor cooling of the milk.
 - iii. Milking dirty cows.
- b. High Somatic Cell Counts are an indicator of a mastitis infection.
 - i. Control will reduce mastitis; therefore it is important for every farmer to develop a control plan.
 - ii. Use good milking hygiene.
 - iii. Insure milking machines are functioning correctly and use them correctly.
 - iv. Dip and disinfect teats before and after milking.
 - v. Treat all quarters of all cows at drying off time.
 - vi. Treat all clinical cases and identified contagious mastitis cases.
 - vii. Cull cows with chronic mastitis.
- c. Remember for every milk quality problem there is a solution.

Note: A power point presentation for this course has been developed. The presentation will parallel the outline, but with more detail.

ANNEX II : Let's Talk About Milk Quality

This annex is the Power Point Presentation to be used with the course outline. The electronic version of the presentation has the narrative in the notes section.

ANNEX III :

A Farmers Guide to Controlling Mastitis (Handout Material)

A Farmers Guide to Controlling Bacteria in Milk

*Prepared for the Kosovo Cluster & Business Support Program
Lindell Whitelock
Consultant*

Providing high quality milk to the milk processor is essential for providing products the consumer will purchase and use. The more dairy products consumers purchase, the more demand there will be for the farmer's milk. **Bacteria** in the milk has a negative impact on the quality of the product and the consumer acceptance of the product. Bacteria in the milk reduce the shelf life of the product, create flavor problems, and also has an impact on the texture of the product. The quality of the milk does not get any better once it leaves the farm, so the farmer is the key in providing high quality dairy products to the consumer.

High bacteria counts in milk are the result of three deficiencies on the farm or in the milk handling process. All of these deficiencies are easily corrected and should be of utmost importance to the farmer. The deficiencies are:

- Milking cows that are wet or dirty.
- Using dirty or improperly cleaned equipment to harvest and store the milk.
- Not cooling the milk soon after it is removed from the cow and keeping it cold.

In the next few paragraphs you can learn how you can reduce the bacteria in your milk and improve your operation.

Milk Cows that are Clean and Dry!

Manure and other foreign material on the cow's teats are laden with bacteria. It is important the cow is housed in clean and sanitary conditions. The bedding, if used, must be changed each day and it must be kept dry. The solution to dirty cows is to wash them with water, but often water also has bacteria. If washing is necessary, it should have a sanitizing solution in the water. It is important only the teat be washed, not the hair on the udder. The hair will retain water that will creep down during the

MILK COWS THAT ARE CLEAN AND DRY!!!!



Milking cows that are not clean and dry does contribute to high bacteria and high SCC. One drop of water was taken for a teat end after a cow was washed with a sanitizing solution and dried. The drop of water was then cultured and the picture indicates what the plate was like after a 12-hour incubation period. Wet udder hair, wet teats, or water being left on the teat leads to this problem. The basic step of udder hygiene is to milk teats that are clean and dry....

Use Clean and Sanitary Equipment to harvest the milk and transfer the milk!

Immediately after milking is completed and the transfer of the milk is complete, it is important that all of the equipment used be washed thoroughly. Whether using hand milking equipment, bucket milkers, or pipeline systems, several steps are required to insure the equipment is cleaned properly. Here are the steps in cleaning equipment.



The key to good equipment cleaning is to use plenty of hot water and the correct cleaning solutions. Household cleaning supplies will not remove the milk fat and protein from the equipment. Good cleaning is essential to lower bacteria counts.

The first step is to wash any manure or foreign matter from the outside of the equipment using warm soapy water and a soft bristle brush.

Once the outside is clean, rinse the milk contact surfaces with water that is 35 to 40°C and discard the water. In a pipeline, allow the water to circulate one time then discharge the water.

Following the rinse cycle, then wash the equipment with hot water 150 to 170°C and a chlorinated alkaline cleaner. The chlorine removes the minerals and the proteins from the equipment while the alkaline emulsifies the milk fat. For pipeline equipment allow the water to circulate for 6 to 10 minutes. If the water temperature drops to 45°C, then discontinue washing.

Following the washing, rinse the equipment with food grade acid in water that is 35 to 40°C to remove the residue from the chlorinated alkaline cleaner and to remove any remaining particles that are left in the system. For pipelines allow the solution to circulate for 5 to 7 minutes and discharge.

Turn the equipment upside down and allow it to drain and air dry until the next washing. Prior to the next milking sanitize the equipment with a chlorine/water solution to kill any bacteria that have grown in the equipment since the last washing.

If you follow these steps, your equipment will be clean and the bacteria count will be reduced.

Keep the Milk Cold!!!

The last step in reducing bacteria in milk is to cool it quickly after harvesting it from the cow and keep it cold. The milk should be cooled to 4°C within one hour after it has been removed from the cow. The milk should be kept at that temperature until it is processed into wholesome dairy products for the consumers.

***Funding for the Preparation of this Document were provided by
The United States Agency for International Development
(USAID)***

***For more information about dairy management contact the KCBS Office,
Pristina, Kosovo***

ANNEX IV: Procedures for Good Cow Milking (Handout Material)

Procedure for Good Cow Milking

The first step in harvesting high quality milk is to follow good milking procedure. This means establishing a routine that will allow for the efficient milking of cows in a sanitary manner. A suggested program is described in the next few paragraphs.



When milking the cow, make sure she is calm and there are no sharp noises or disturbing sounds. When cows are comfortable and relaxed, the cow will produce a hormone called oxytocin, thus squeezing the milk from the milk sacks in the udder. This is a good time to feel the udder and see if it has fever, is hard or has other indications of injury or mastitis. Now we are ready to start the milking procedure.



Strip the foremilk. By stripping the foremilk, we remove most of the bacteria laden milk from the cow. This also enables us to determine if the milk is normal or not. If abnormal milk is detected, then steps should be taken to determine if the cow has mastitis, what steps need to be taken for treatment. Every cow with abnormal milk should be screened for potential problems.



The CMT (California Mastitis Test) is a cowside test that can be completed quickly and will indicate if the cow has an elevated SCC or not. If the mastitis is detected, then treatment should follow. Periodically a cowside test should be done on suspect cows to identify cows with elevated SCC counts. This step will help the farmer lower the SCC for the farm and will lead to the production of high quality milk.



This is not a good way to check for abnormal milk. This person will only spread any microorganisms to other cows in the herd. The hands of the people milking the cows can be an agent for the spread of mastitis from one cow to the next. A recommended practice is to wear latex gloves when milking. Workers hands have many places where bacteria can hide, thus spreading them to other cows in the herd.



Dipping the cow with an approved teat dip before milking is recommended. When dipping the cow, the agent should be left on the teat for 20 – 30 seconds before removal. If the udder is dirty or contaminated with manure or other matter, the foreign matter should be removed prior to dipping the cow. This practice is known to greatly reduce the bacteria count in herds and aids in the prevention of mastitis.



If the udder must be washed, wash only the teats and use a minimal amount of water. Wet udders lead to high bacteria counts and are a good way to create new cases of mastitis. The preferred method of preparing cows is to predip with an approved product.



When removing the dip or drying the cow, use a single service towel. If a cloth is used, do not use the cloth on other cows. Dirty cloths can be a way to spread mastitis and increase the bacteria count in the herd.

Milk cows that are clean and dry!



A common wash bucket and common cloth is a very good way to spread mastitis from one cow to the next. I call this a disaster waiting to happen.



Attach the cluster quickly so as to allow very little vacuum loss during the process. A cluster that is in the proper position will have a slight downward and forward position under the cow. While the cow is being milked, listen for squawks or other signs of air being allowed to enter the system. Air leaks usually indicate it is time to change liners or to have the system checked.



When the milking process is complete, **shut off the vacuum** and allow the air pressure to stabilize before removing the claw. Removing the cluster under vacuum not only increases the chances of injury, but it also allows a back splash of milk that can increase the risk of mastitis.

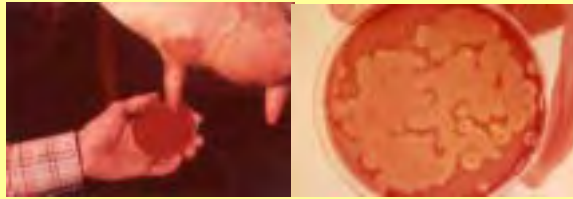


Following milking the cow, dip the teats. Make sure the dip and the dip cup are clean and not contaminated. Contaminated dip cups will reduce the effectiveness of the dip, this decreasing the benefits of using the product. If it is possible to keep the cow standing for 45 minutes after milking, it is recommended. This allows the teat time to completely close and thus reduces the risk of microorganisms from entering the udder.



Spraying of dip often leads to not getting the teat covered. The preferred method of dipping cows is to use a dip cup.

MILK COWS THAT ARE CLEAN AND DRY!!!!



Milking cows that are not clean and dry does contribute to high bacteria and high SCC. One drop of water was taken for a teat end after a cow was washed with a sanitizing solution and dried. The drop of water was then cultured and the picture indicates what the plate was like after a 12-hour incubation period. Wet udder hair, wet teats, or water being left on the teat leads to this problem. The basic step of udder hygiene is to milk teats that are clean and dry....

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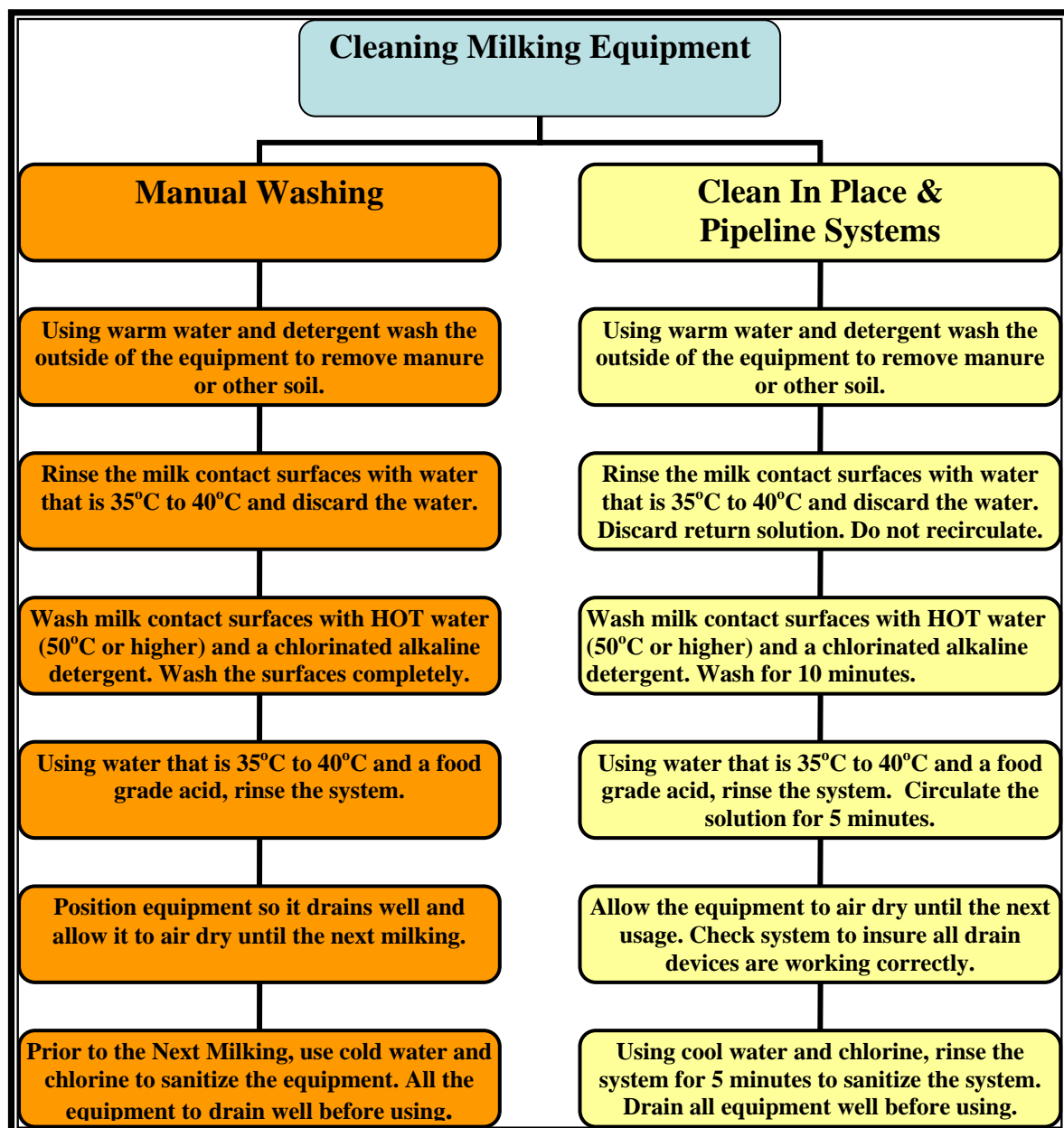
***For more information about dairy management contact the KCBS Office,
Pristina, Kosovo***

ANNEX V:

Sanitizing Milking Utensils (Handout Material)

Sanitation of Milking Utensils & Storage Tanks *A KEY to Quality Milk* *Lindell Whitelock* *Consultant*

Keeping equipment clean and sanitary is one of the keys to reducing bacteria counts in milk. The procedures for cleaning equipment, whether using a pipeline with a “Clean In Place” system, or manual washing require the same steps. Proper cleaning of equipment is a MUST for producing high quality milk.



Cleaning of the milking equipment and cooling tank must be done after every milking to reduce the bacteria in milk. Reducing the bacteria in equipment will also reduce the risk of mastitis in the cows. The key to good the correct cleaners and water of the correct temperature to insure the equipment is properly cleaned.

1. The water being used in for cleaning of the equipment should be tested. It should be free of disease causing bacteria, and the amount of buffers and calcium in the water should be known. Water that is high in buffers and calcium is “hard” and limits the effectiveness of the detergents used.
2. The purpose of washing the exterior surfaces of the equipment is to remove any manure or soil from the equipment. To correctly clean the equipment, use warm water and a manual cleaning detergent that is low foaming.
3. When rinsing the equipment, do not allow water to recirculate in pipeline systems. As the water starts to return to the wash vat from the pipeline, allow it to be diverted to the drain. The temperature of the water at rinsing is VERY IMPORTANT. Water that is too hot will bond the protein to the metal equipment, while cold water will bond the milk fat will bond to the equipment.
4. Washing milk contact surfaces must be done with a chlorinated alkaline cleaner. The alkaline is necessary to remove the milk fat, while the chlorine is necessary to remove the protein, and minerals from the system. Household detergents and cleaners are not recommended for this task.
5. The purpose of the acid rinse is to remove the particles of milk that are left and to remove any residue left by the cleaning detergent.
6. It is important that all water and cleaning solutions be removed from the system and that it be allowed to dry before the next use.

Proper cleaning takes time, but the rewards of lower bacteria counts in milk and the reduced risk of mastitis are worth the effort.

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***For more information about dairy management contact the KCBS Office,
Pristina, Kosovo***

ANNEX VI:

Harvesting Milk by Hand & Cleaning Utensils (Handout Material)

Harvesting Milk By Hand And Cleaning Milking Utensils

*Lindell Whitelock
Consultant
Kosovo Cluster & Business Support Project*

Many cows are still milked by hand. Bacteria counts in milk harvested by hand are often very high because the dairyman does not follow good milking procedures. Following a few simple rules and steps can improve the quality of milk tremendously and can lead to less subclinical mastitis in the cows he owns. Steps must be taken to insure the milk is properly handled to avoid unacceptable odors and tastes in the milk.

1. It is recommended that calves be separated from cows, if milk is to be harvested and marketed. However, if this practice is not used, allow the calf to nurse before preparing the cow for milking. Preparing the cow, then allowing the calf to nurse will leave large amounts of saliva from the calf on the teat, and this saliva will be laden with bacteria.
2. Keep the cows in clean housing with adequate amounts of fresh bedding. Remove the manure and bedding each day to reduce the amount of foreign material on the cow and to avoid unacceptable odors in the milk.
3. Cleaning the cow for milking requires special attention. Since most of the cows will be milked in facilities where water is not readily available special care will need to be taken to insure the washing solution is effective.
 - a. Mix warm water and a “udder wash” detergent in a pail. The udder wash solution should contain a disinfectant such as iodine.
 - b. Using a paper towel or cloth towel, dip it into the solution and wash the cow.
 - c. Once the cleaning of the cow is completed, do not return the cloth to the pail. Put it aside and use another cloth for the next cow.
 - d. Wash only the teat. The cleaning zone should not include the udder hair and the base of the udder, only the teat.
 - e. Dry the teat.
4. Forestrip the milk to check for mastitis. Do not Forestrip into the container that will be used during the milk harvesting procedure.
5. Predip the cow with an approved predip solution.
6. Remove the dip completely using an individual towel, or a previous towel that was used on this cow. Do not use cloths on more than one cow.
7. Milk the cow taking care to keep foreign material from entering the pail.
 - a. Pails should be easy to clean and should not contain any welded seams. Welded seams provide a surface that can not be thoroughly cleaned and will result in bacteria growth between milkings.

8. When the milking process is completed, dip the teat to provide protection from environmental mastitis.
9. Filter or strain the milk when it is transferred from the milking pail to the transport can or pail.
10. Wash the milk pail and any other utensils used in the process.
 - a. Rinse the pail with water that is 35°C to 40 °C and discard the water. This is necessary to remove any milk solids remaining in the pail.
 - b. Using hot water (as hot as the hand can endure) and an alkaline chlorinated cleaner, wash the milk contact surface of the pail. Use a brush and wash vigorously. At this time the outside of the pail should also be washed to remove any manure or soil that is on the outside pail.
 - c. Rinse the pail with a food grade acid to remove the detergent residue.
 - d. Turn the pail over and allow it to drain until the next milking.
 - e. Prior to the next milking, using a mild chlorine solution, rinse the interior of the pail. Do not follow the rinse with clear water or dry with a cloth.
11. As soon as all of the cows are milked, take the milk to the collection center for cooling. It is important the milk be cooled to 4 °C within one hour after the milk has been harvested. The milk should be kept at this temperature until it is transported to the processing plant. Allowing the milk temperature to rise increases the bacteria and will reduce the quality of the milk.
12. **Do not include any milk from cows that have been treated with antibiotics in the milk that is being sold. Always follow recommended withdrawal times for cows treated with antibiotics. The withdrawal time applies to both intramammary infusions as well as intramuscular injections.**

Developing and Following A Good Milking Routine Results in High Quality Milk, Healthier Cows, and More Profits for the Dairyman.

If you have Questions, contact your Milk Processor or Dairy Professional.

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***For more information about dairy management contact the KCBS Office,
Pristina, Kosovo***

Let's Talk About Milk Quality!!

A hand is holding a petri dish containing a dark, agar-based medium. The surface of the medium is covered with numerous small, white, circular bacterial colonies. Some colonies are isolated, while others are in clusters. The background is a blurred outdoor scene.

**Milk Quality Improvement
Project
KCBS
December, 2005**



A photograph of a woman with short, curly brown hair, wearing a blue V-neck top, a pearl necklace, and earrings. She is holding a clear glass filled with a white liquid, likely milk, and drinking from it. In the background, there is a white refrigerator with several magnets and a bowl of fruit on top. The text "Flavor or Taste is the Most Important Requirement of Consumers" is overlaid in a large, bold, red font with a blue outline.

**Flavor or Taste is the Most
Important Requirement of
Consumers**

Consumers Demand

1. Long Shelf Life.

2. Consistent Taste.

3. Safe Products



High Bacteria Counts...

- Shorten Shelf Life.
 - Pasteurized Milk
Should Have a Shelf
Life of 14 days or more.
- Change the Chemical
Structure of Milk
Resulting in Poor Taste.



High Somatic Cell Counts Impact Milk Composition.

- ✓ **Lipase increases free fatty acids**
- ✓ **Plasmin reduces casein content**
- ✓ **High SCC reduces shelf life**

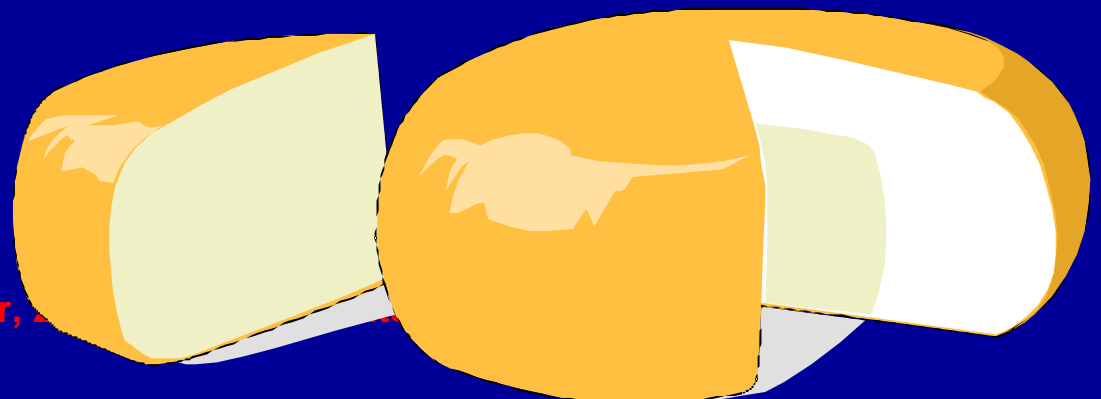
(Each May Result in Poor Flavors)

High SCC Changes Milk Composition...

- Lactose (5 to 30%)
- Total Protein will be Reduced
- Casein (6 to 18%)
- Solids not Fat (SNF) (Up to 18%)
- Total Solids (3 to 12%)

Somatic Cell Counts and Cheese Yield

- ✓ Decreasing SCC from 340,000 to 240,000 Increased Cheese Yield 1%
- ✓ Decreasing SCC from 640,000 to 240,000 Increased Cheese Yield 3.3%
- ✓ Flavor, Shelf Life, and Quality Also Increased





The Quality of Milk Arriving at the Milk Processing Plant is Determined by.....



Our Goal:

**Provide Consumers With Products of the
Highest Possible Quality**





**Low Quality Milk Will Result in the
Production of Less Cheese and Other
Processed Dairy Products**



Farmers Benefit from an Increased Demand for Dairy Products



High Quality Raw Milk..

- Has a Low Standard Plate Count.
 - Has a low Psychrophile Bacteria Count.
- Has a Low Somatic Cell Count.
 - Has less than 200,000 SCC/ML.
- Contains NO inhibitors or Adulterants.
- Is stored at Cold Temperatures.

High Quality Milk...

Should Not Contain Added Water or
Cleaning and Sanitizing Chemicals

High Quality Milk...



**Milk Should be Free of Antibiotic
Residues**

High Quality Milk...

A photograph showing a person's arm holding a white, cylindrical milk filter. The filter has a blue string tied around it. The background is a blurred indoor setting, possibly a dairy farm or processing facility.

**All Milk Should be Filtered, and Filters
Should be Clean at the End of Milking**



High Quality Milk...

**Milk Should be Cooled Soon After
Milking**



High Quality Milk...

Milk Should be Cold During
Transport

High Quality Finished Products

1. Start with high quality raw milk.
2. Pasteurize properly.
3. Avoid post-pasteurization contamination.
4. Store at cold temperatures.

A photograph of a dairy processing plant. In the foreground and middle ground, there are several rows of blue plastic crates. Each crate is filled with white milk cartons. The crates are stacked in a way that shows multiple rows receding into the background. The background is slightly out of focus, showing more of the plant's interior, including some equipment and a ceiling with lights. The overall scene suggests a large-scale production and packaging of dairy products.

High Quality Finished Dairy Products...

**Milk Should be Cold at the Milk
Processing Plant**

High Quality Finished Dairy Products...

**Milk Should be Kept Cold During
Transport to Stores Where it is Sold**



High Quality Finished Dairy Products...







Milk Quality is affected by...

**Dirty Cows Often Impart an
Unacceptable Taste or Odor to Milk**



Milk Quality is affected by...

**Improperly Cleaned Cloths for
Washing Udders Often Impart an
Objectionable Taste to Milk**

Milk Quality is affected by...



Unsanitary Water May Result in Bad Flavors
in Milk

A photograph of a brown and white cow standing in a green grassy field. A small brown calf is partially visible behind the cow. In the background, other cows are grazing, and there are trees and a fence line under a clear sky.

Milk Quality is affected by...

**Colostrum Should Not be Added to
Milk That Will be Sold to Consumers**

Milk Quality is affected by...





Milk Quality is affected by...

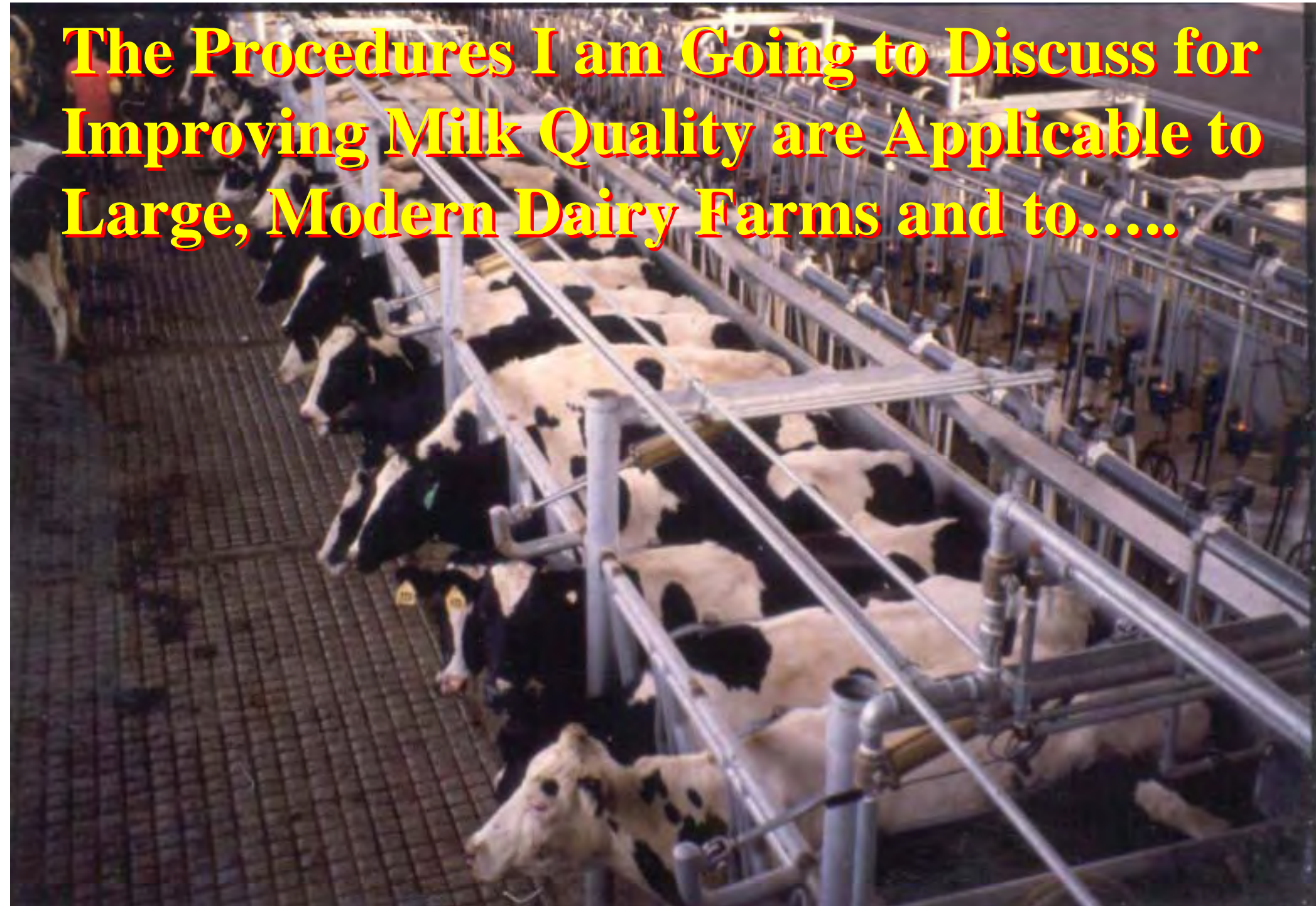
**The Presence of Mastitis Results in Poor
Flavor in Milk**



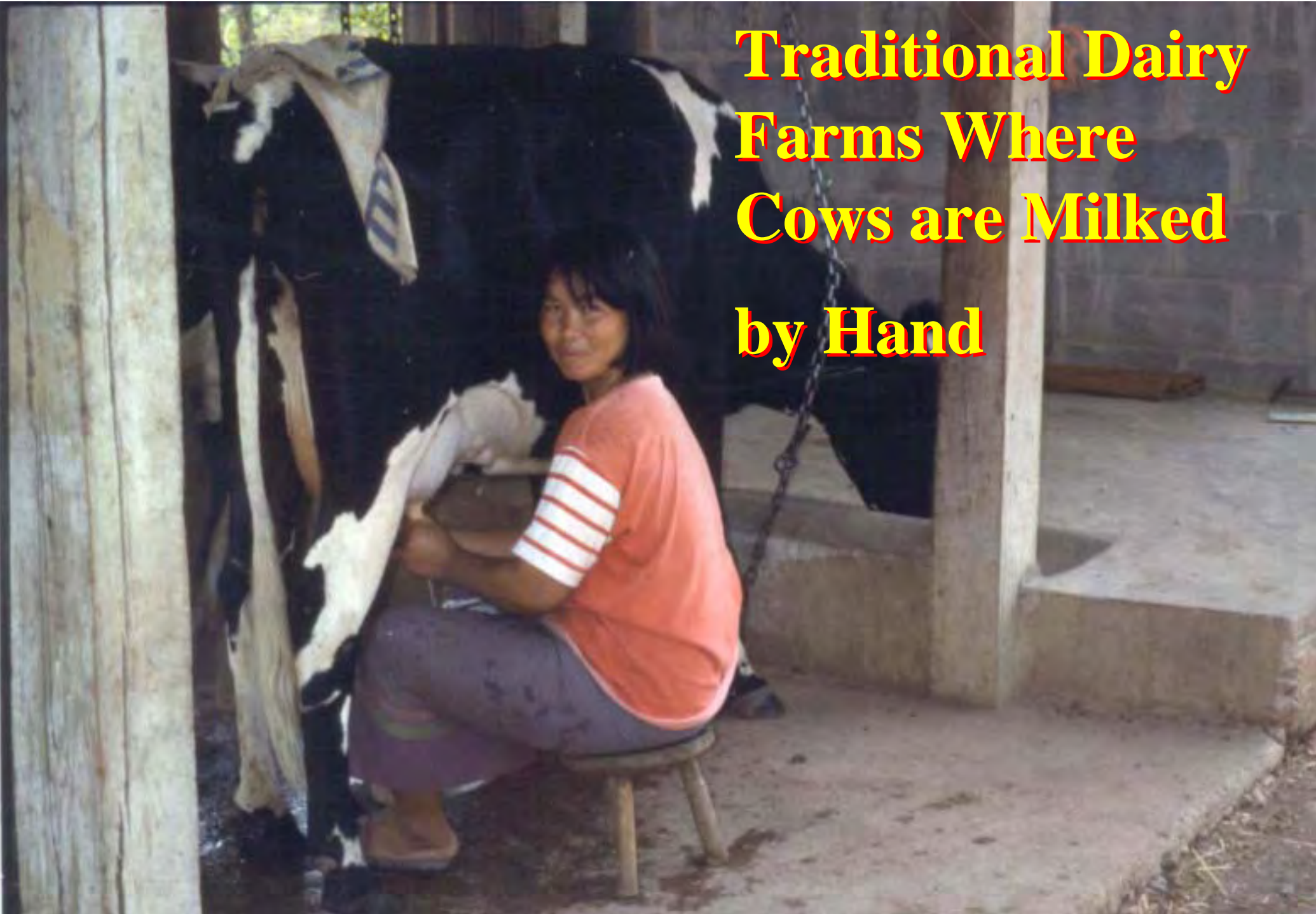
Milk Quality is affected by...

Flavor Problems May Also Result From Improperly Cleaned Milking Equipment

The Procedures I am Going to Discuss for Improving Milk Quality are Applicable to Large, Modern Dairy Farms and to.....



**Traditional Dairy
Farms Where
Cows are Milked
by Hand**



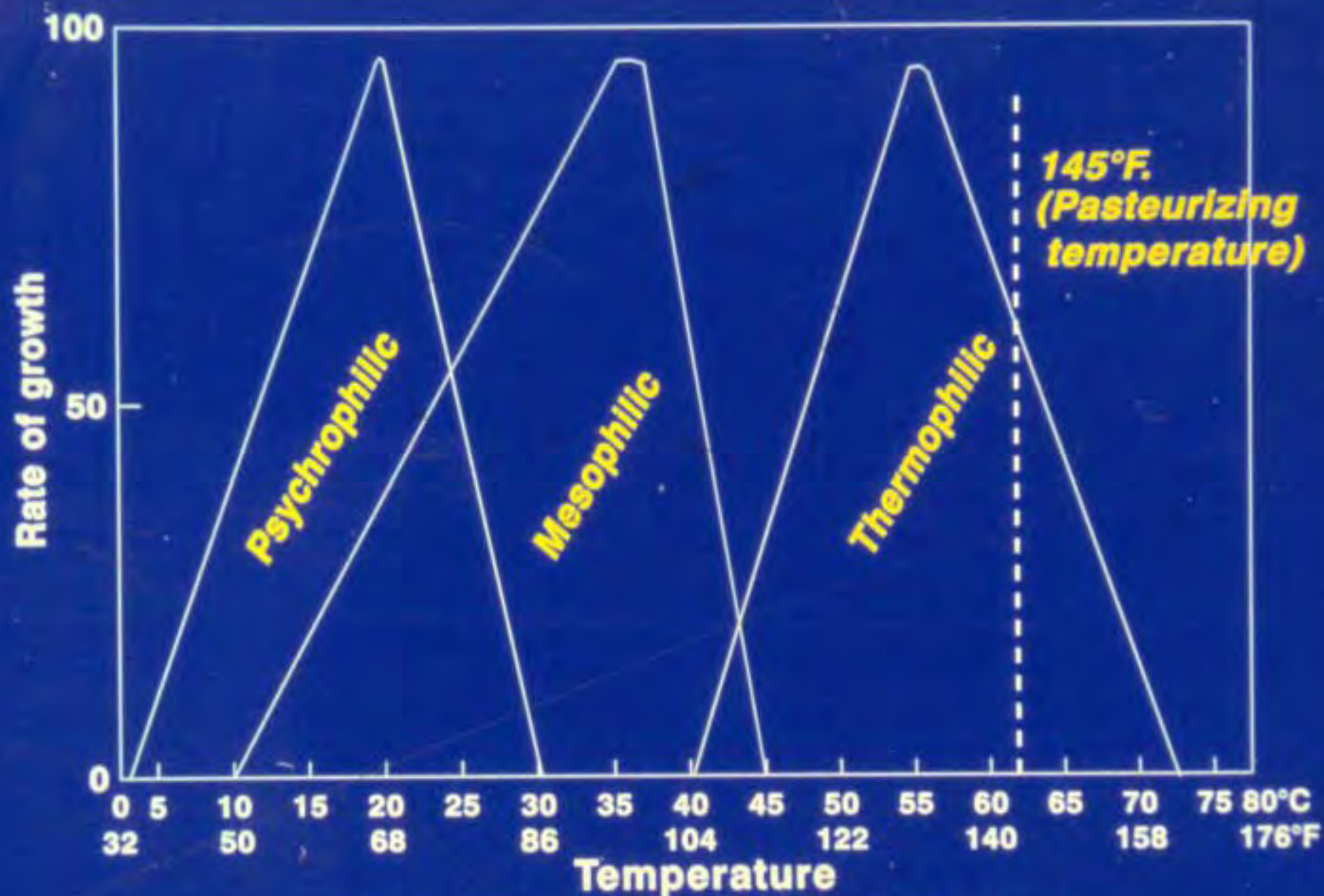


**Remember, For Every Milk Quality
Problem There is a Solution**

Bacteria Counts...

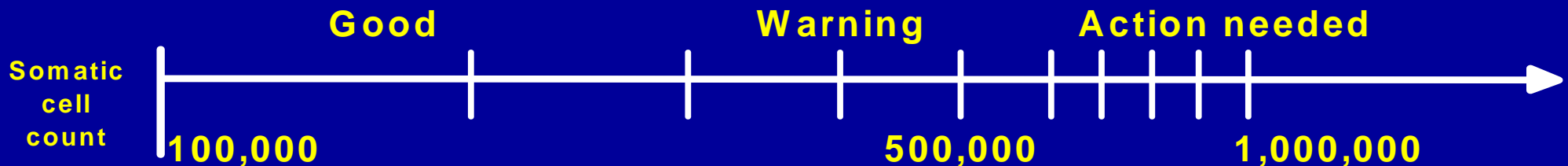
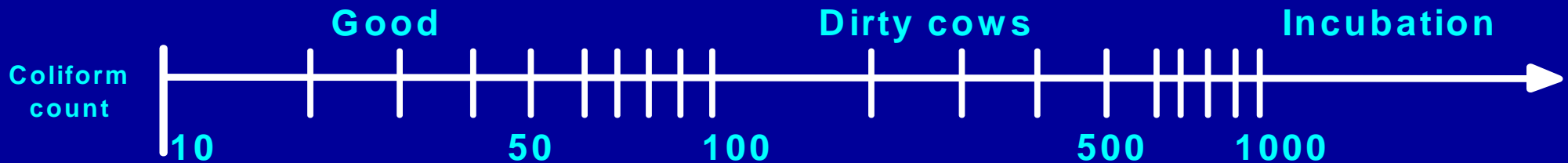
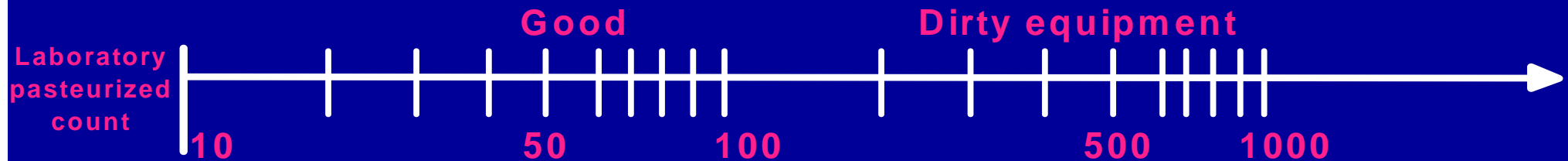
- Quick to Change.
- Easy to Correct.
- Easy to detect problem by examining the sample culture.





GROWTH OF BACTERIA IN MILK

Goals and Action Levels on Bulk Milk Test



Prepared for KCBS, December, 2005 by Lindell Whitlock, Consultant

**This is Evidence of a Very High
Bacteria Count in Herd Milk**



Improperly Cleaned Equipment...

- Insure Equipment is Clean.
- Inspect Equipment for cleanliness on a regular basis.
- Insure Automatic Washing Equipment is Functioning Correctly.
- Possible Problems.
- Incorrect Water Temperature.
- Cleaning Products not suited for the task.
- Faulty Washing Equipment.
- Equipment left with water after washing.



Procedures for Cleaning Milking and Milk Storage Equipment

A close-up photograph of a metal dialysis filter, which is a circular device with a small handle. The interior of the filter is visible and contains a yellowish-brown, irregular deposit, likely protein. The filter is connected to several black and white tubes. The background is a light-colored, possibly tiled, surface.

**This is Evidence of Protein and
Inadequate Cleaning**

This Milk Hose Has Not Been Cleaned Properly





The image shows two white, cylindrical water heaters standing side-by-side in a utility room. The water heater on the left has a yellow EnergyGuide label and a brown rectangular label above it. The water heater on the right is plain white. In the background, there are white cabinets and a wooden stool. The text "Good Cleaning Requires Hot Water" is overlaid in a large, bold, yellow font with a red outline at the bottom of the image.

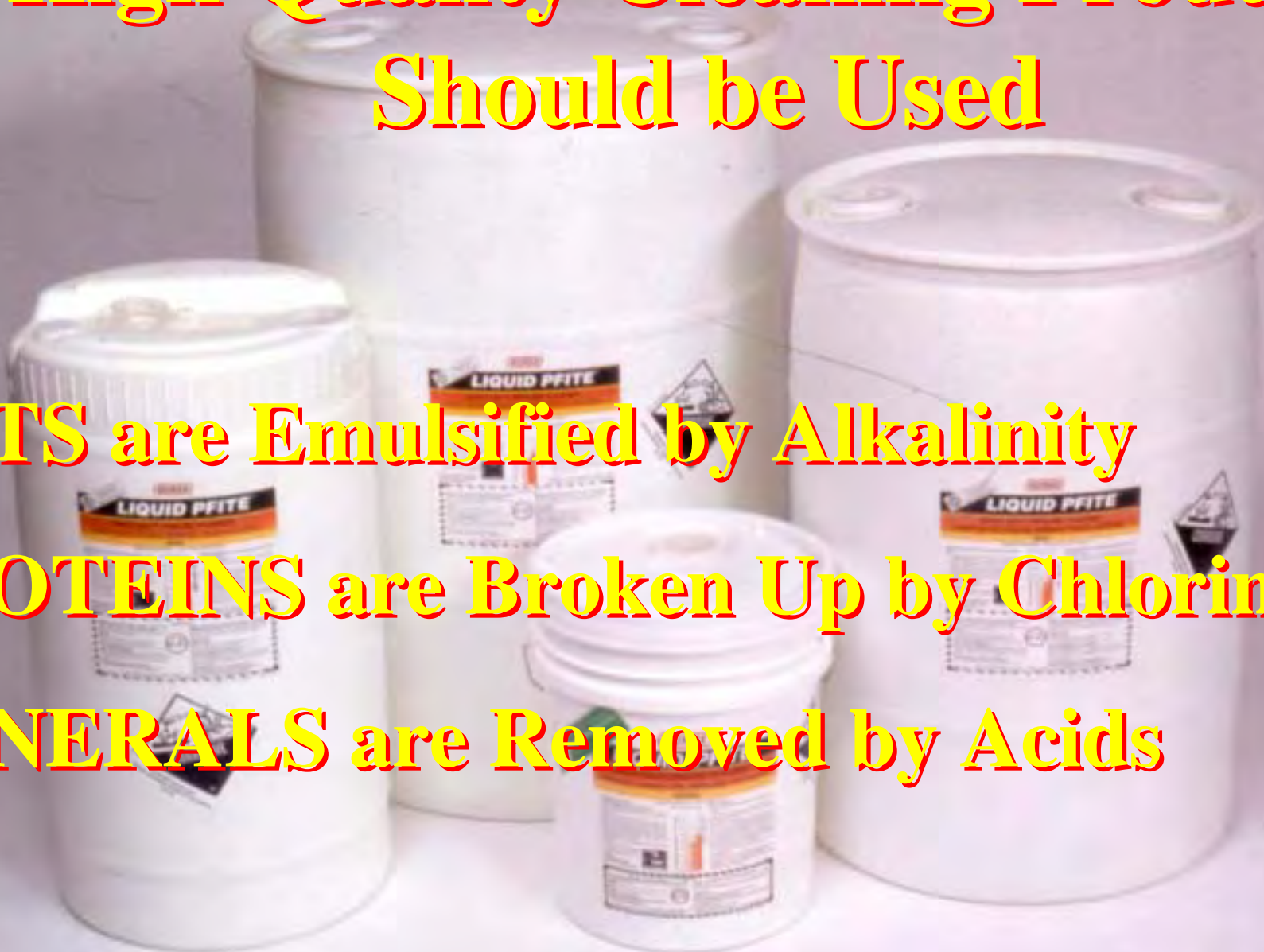
Good Cleaning Requires Hot Water

High Quality Cleaning Products Should be Used

FATS are Emulsified by Alkalinity

PROTEINS are Broken Up by Chlorine

MINERALS are Removed by Acids





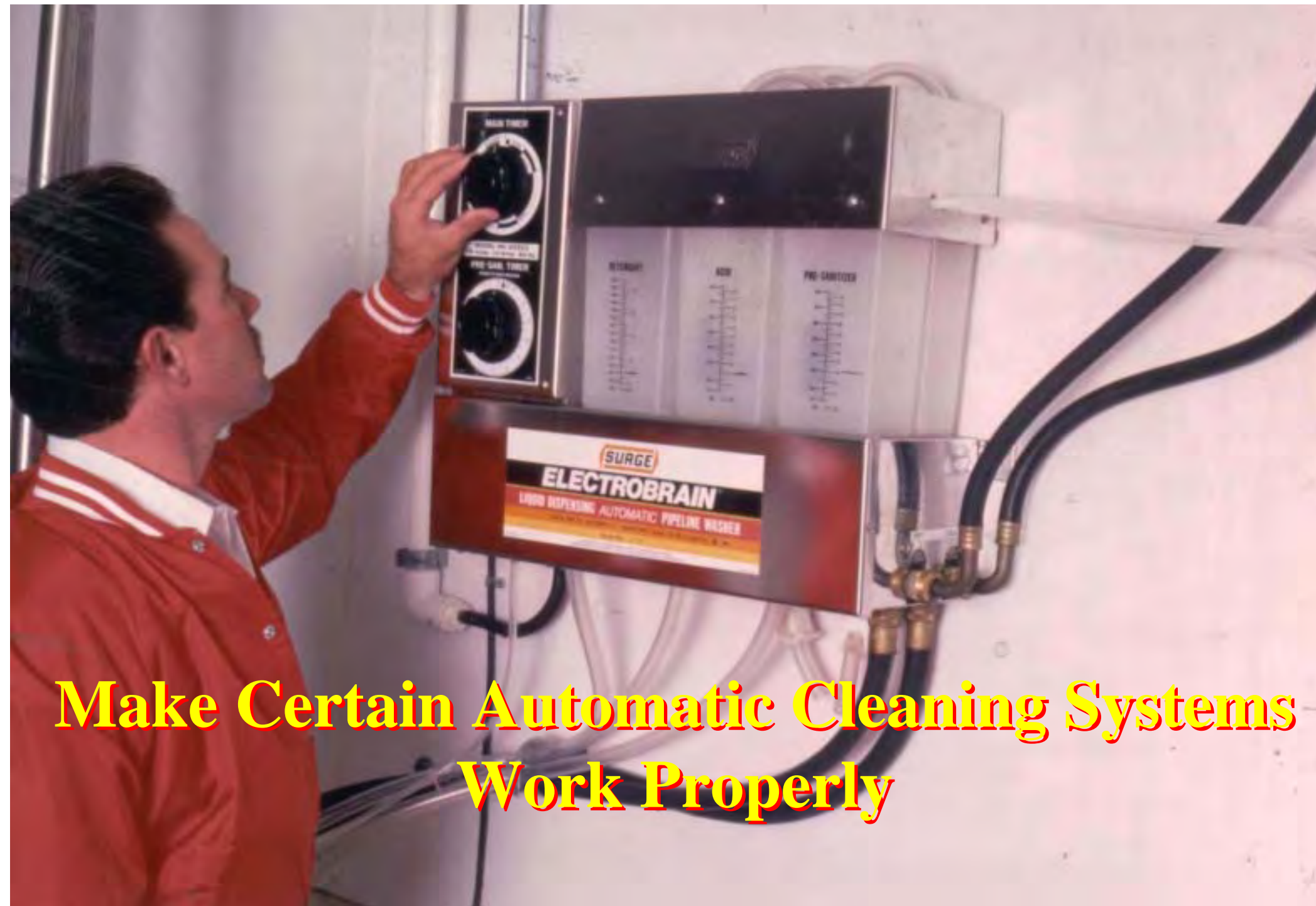
**Cleaning Products Must Be Properly
Stored.**

Household Products are Not Suitable for Cleaning Milking Equipment





Cleaning Products Should be Non-foaming



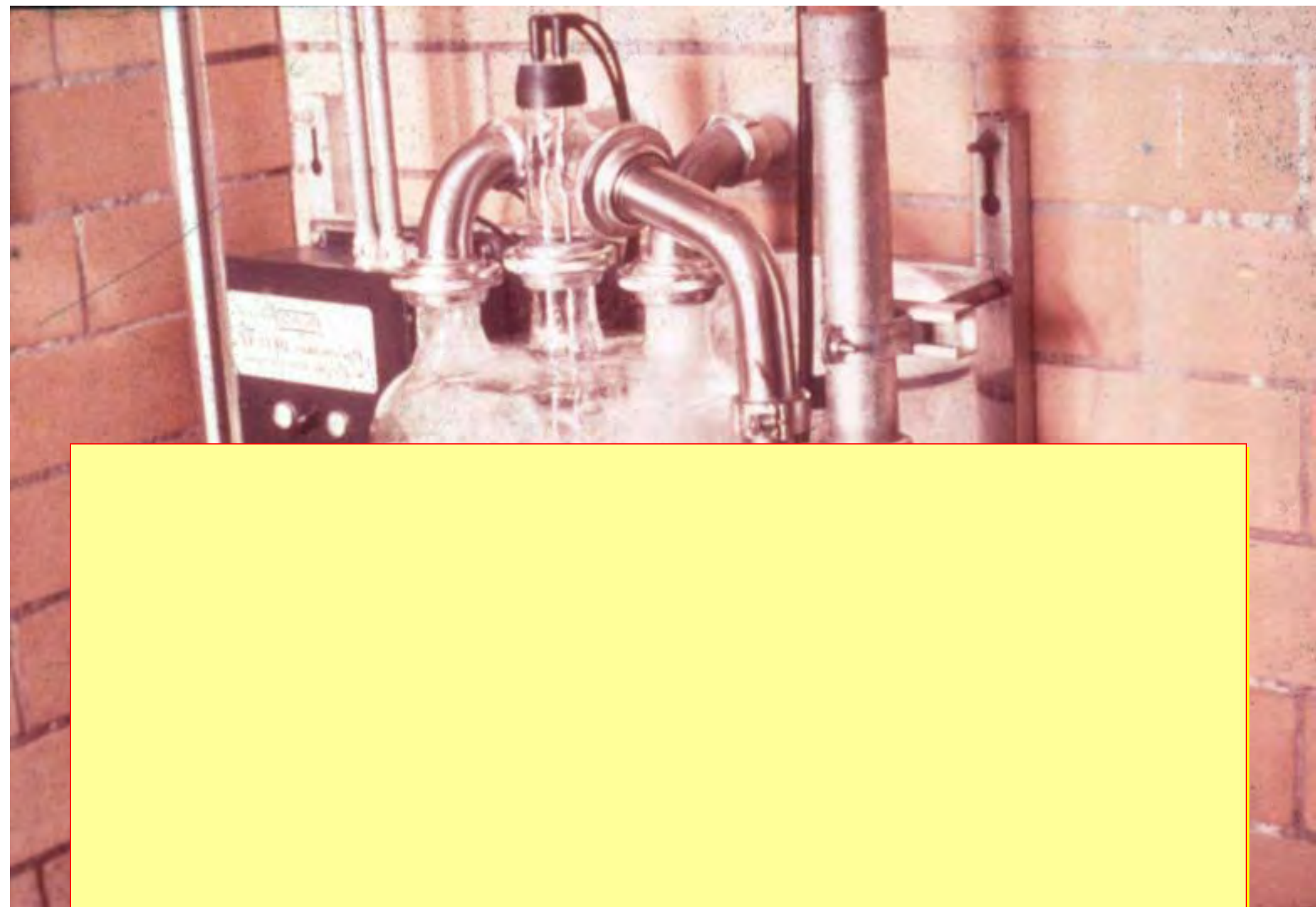
**Make Certain Automatic Cleaning Systems
Work Properly**



Washing the Milking System...

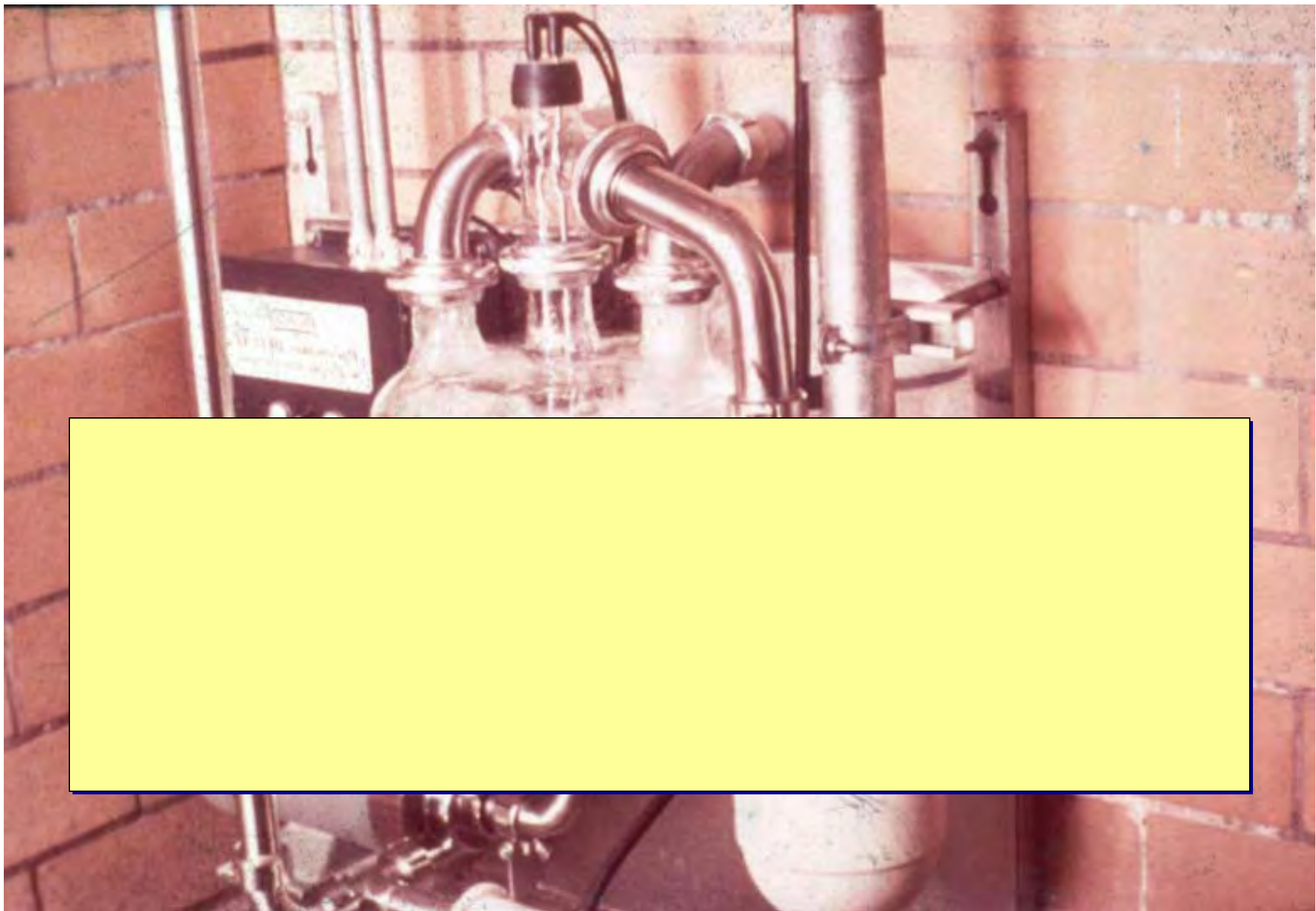
- Water Temperature: 35°C – 40°C
- Allow Water to Circulate one time.
- Discharge Water upon Return.













**Milking Systems Should Have
Automatic Drains**

Washing the Milking System...

- Sanitizing Water should be 55°C to 65°C.
- Use the Recommended Amount of Chlorine Sanitizer.
- Allow Solution to Circulate for 5 Minutes.



A close-up photograph showing a person's hands being scrubbed with a white brush in a stainless steel sink. The person's right hand is holding the handle of the brush, while their left hand is being scrubbed. The brush has a white head and a metal handle. The sink is made of stainless steel and has a drain. The background is dark and out of focus.

**Hand Cleaning Requires Scrubbing
Action**



Milk Storage Tanks Must be Clean and Sanitized

Good Milking Hygiene..

- **Milk Cows that are Clean and Dry.**
- **Use Pre Dipping Programs.**
- **Use Individual Towels to Clean Cows.**
- **Eliminate Long Hair on the udder.**
 - **Clip the hair on the udders.**
 - **Singe the hair to remove hair.**





**These Teats are not Clean Because
They are not Dry**



Magic Water





These Colonies of Bacteria Grew from One Drop of Water





Cool Milk Has Less Bacteria..

- Cool Milk Quickly after harvesting.
- Insure Milk Temperature does not rise when additional milk is added.
- Cool milk to 4°C and maintain that temperature.
- Milk should be cool within 2 hours after milking is completed.

Storage of Low Count Milk

Time (HR)	Temperature (°C)		
	5°	10°	15°
0	4,300	4,300	4,300
24	4,200	14,000	1,600,000
48	4,600	128,000	3,000,0000
72	8,300	5,750,000	326,000,000

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Bacteria Counts
Are
Easy to Correct...

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Somatic Cell Counts Are More Difficult to Reduce...

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Mastitis is a World Wide Problem

Maggie Murphy

Mastitis Is the Most Expensive Disease of Dairy Cattle



SCC and Lost Herd Milk

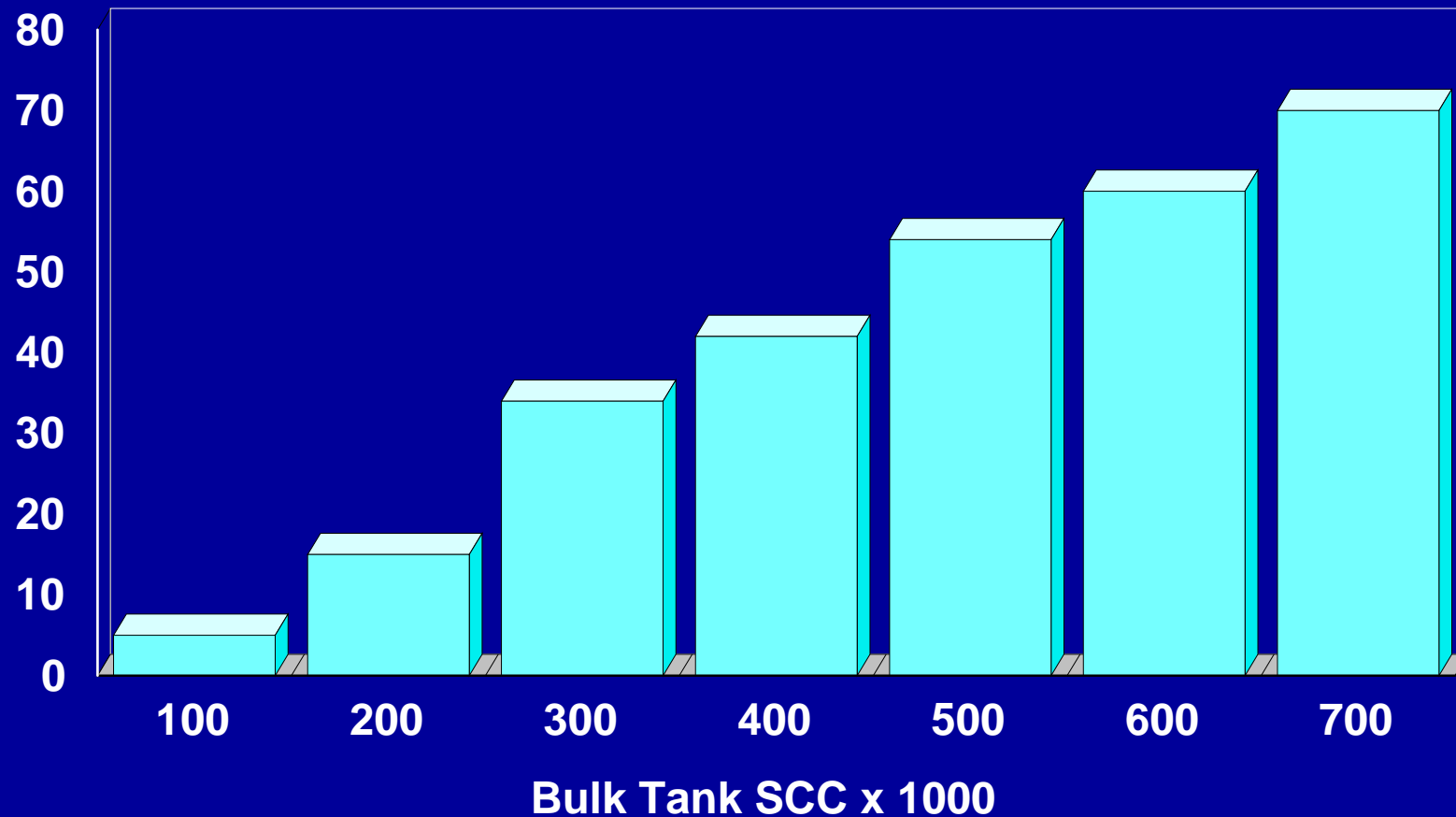


**2.5% Loss in Milk for Each 100,000
Increase in SCC Above 200,000.**

**Example: Herd SCC of 500,000 = 7.5%
Loss in Herd Milk Production**

Association of Bulk Tank SCC and Herd Infection Status

% Cows Infected



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A High Somatic Cell Count Signals Presence of **MASTITIS**



A photograph of a black and white cow, likely a Holstein, standing in a grassy field. The cow is facing right, and its head is slightly lowered. The background shows a line of trees under a clear sky.

Factors Influencing Mastitis

Milking Equipment..... - 6%

Housing and Environment..... - 25%

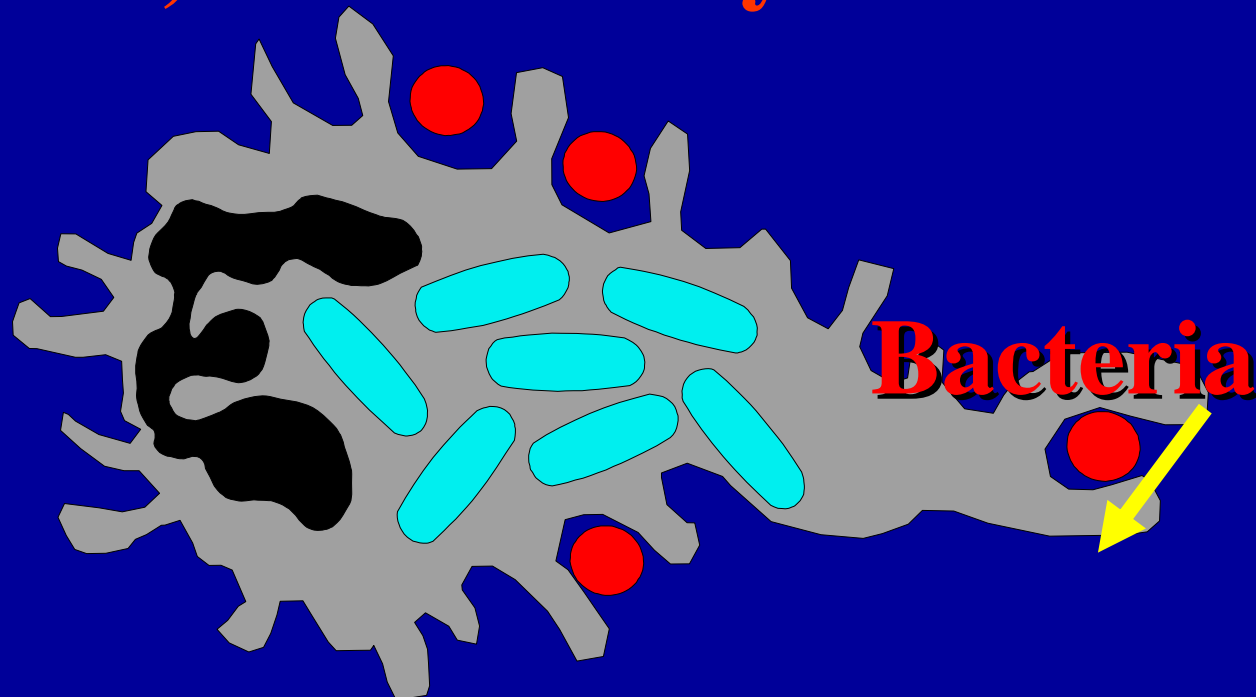
Genetics..... - 20%

Management..... - 49%

SCC and Infection Status

<200,000 Probably not Infected

>300,000 Probably Infected



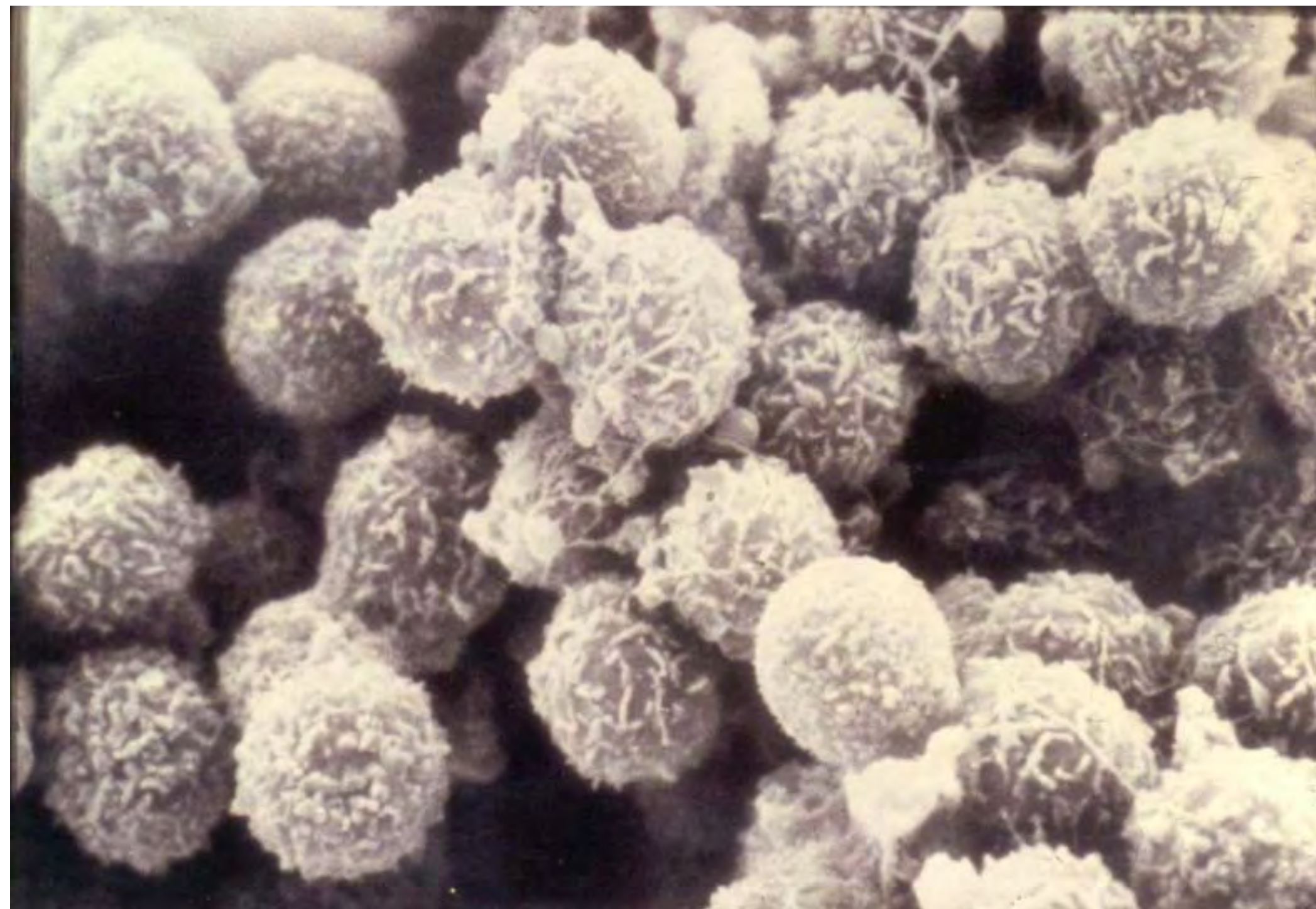
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The Key to Mastitis Control Is.....

Prevention



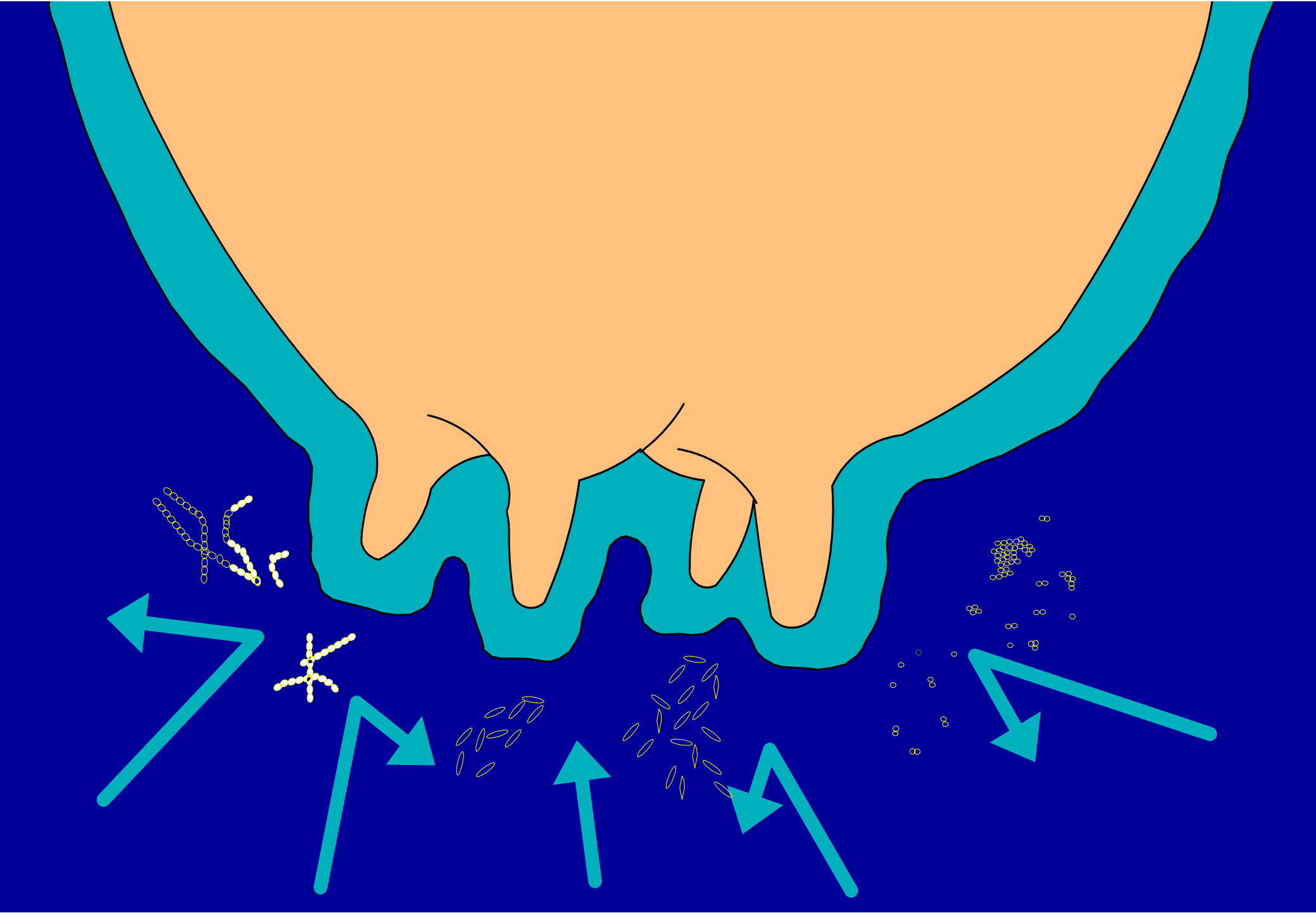
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White Blood Cell Engulfing a Microorganism



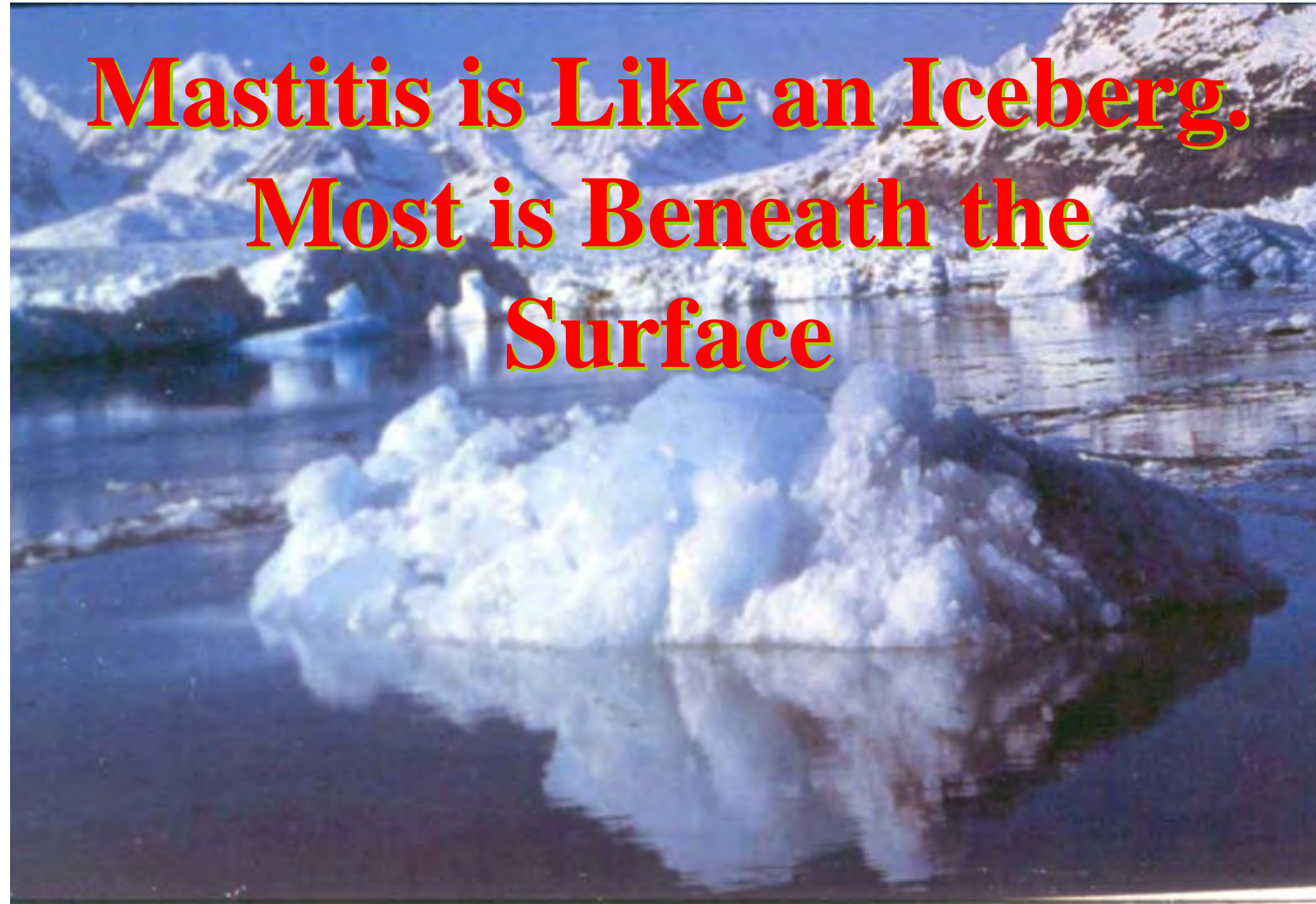








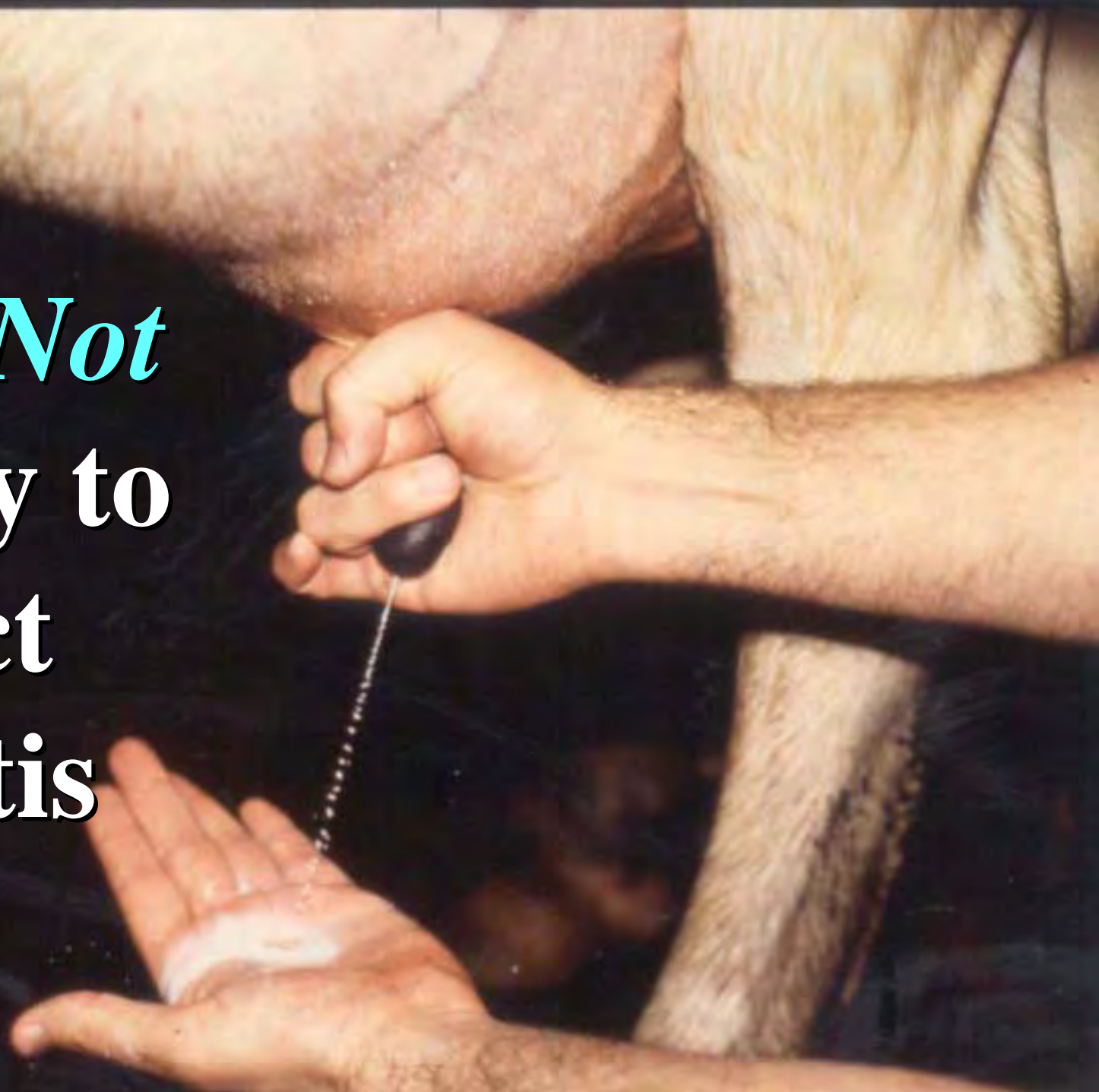
**Mastitis is Like an Iceberg.
Most is Beneath the
Surface**







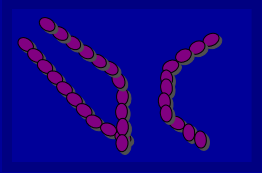
This is *Not*
the Way to
Detect
Mastitis



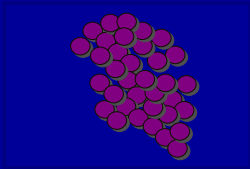
**You Must KNOW the Cause to
DEVELOP the Control...**



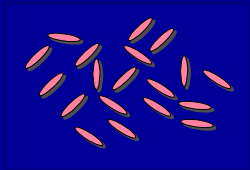
Common Mastitis Organisms



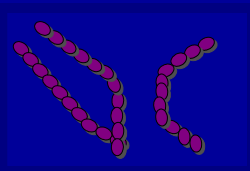
Streptococcus agalactiae



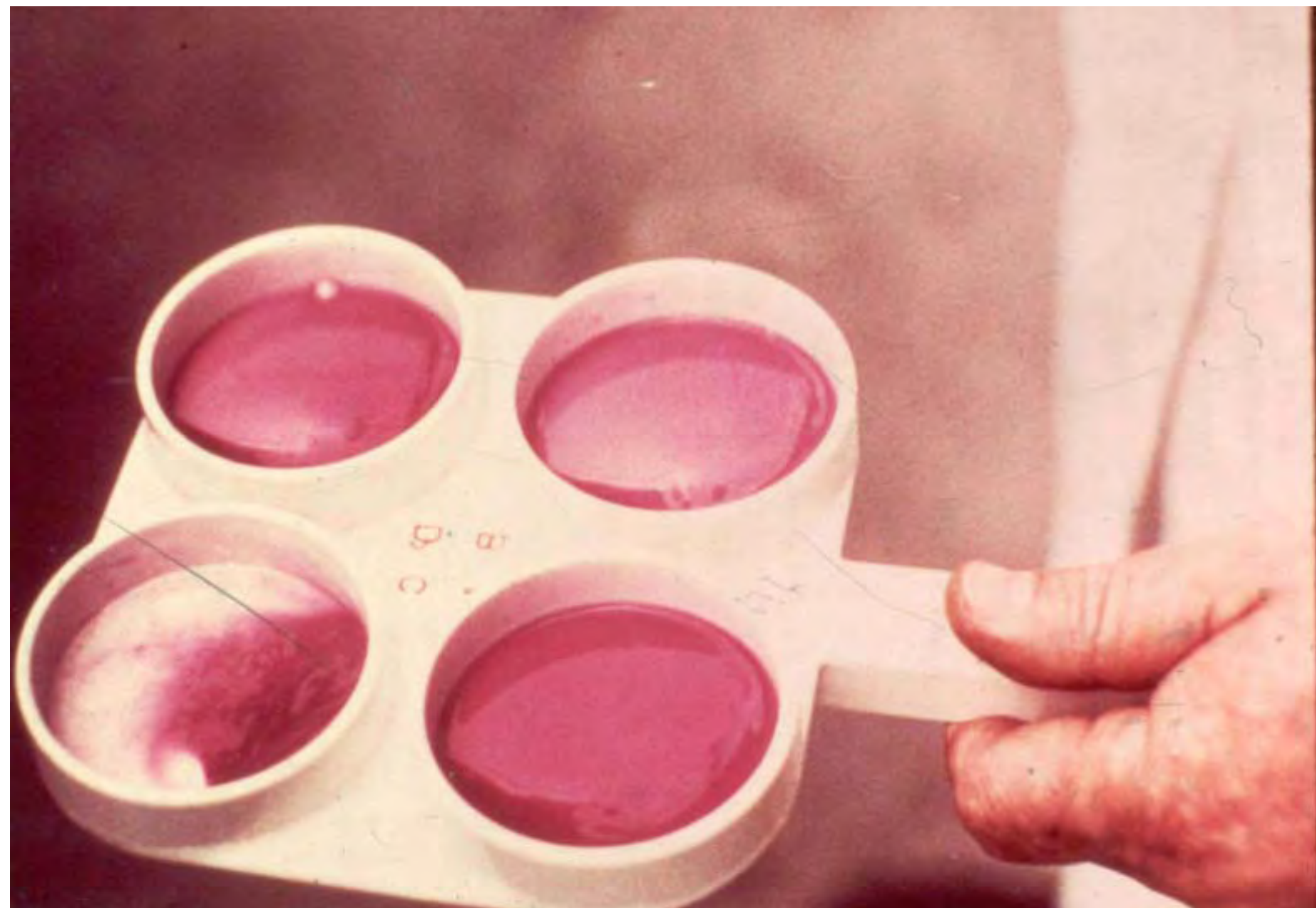
Staphylococcus aureus



Coliforms



Other streptococci



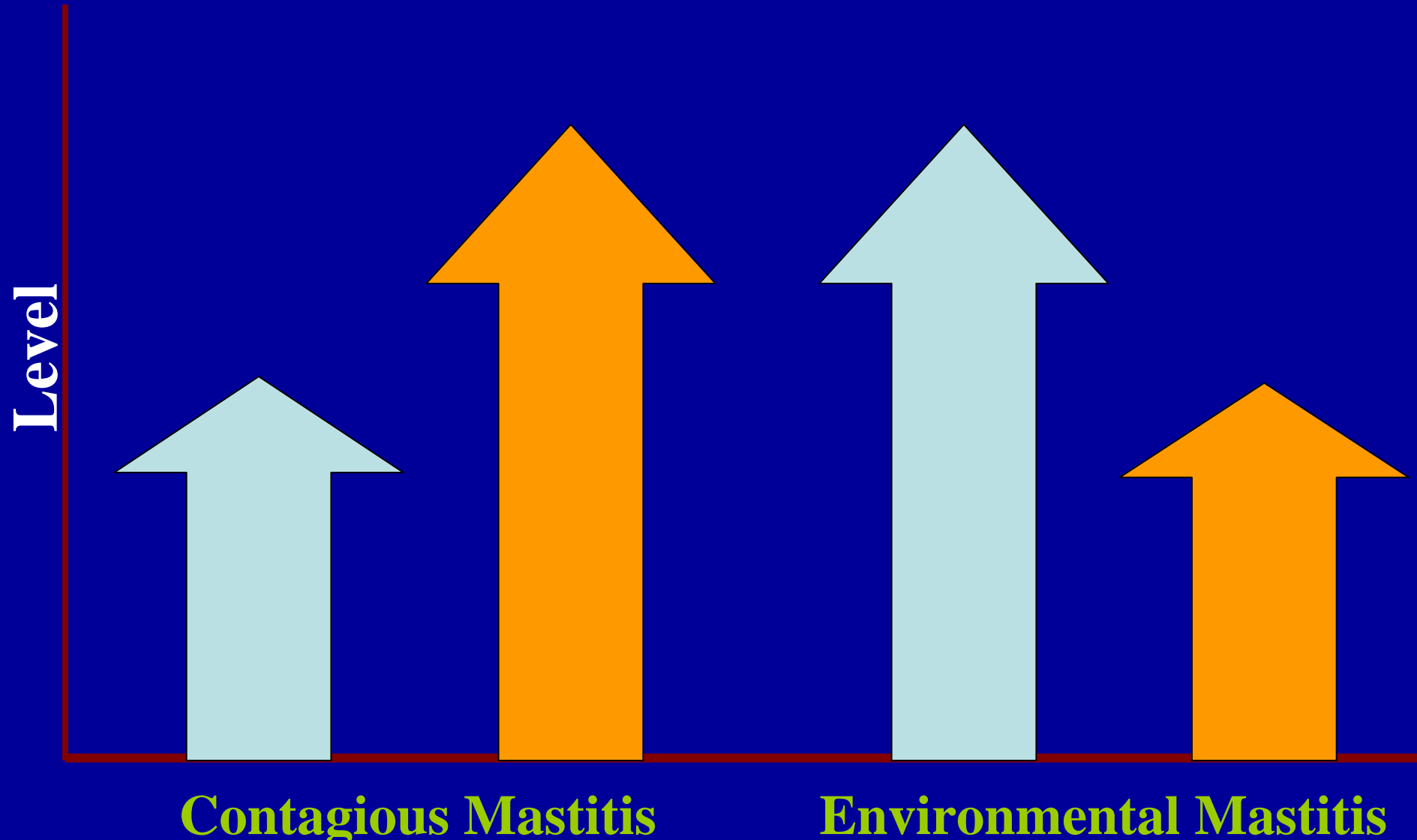


*Streptococcus
agalactiae*

*Staphylococcus
Species*

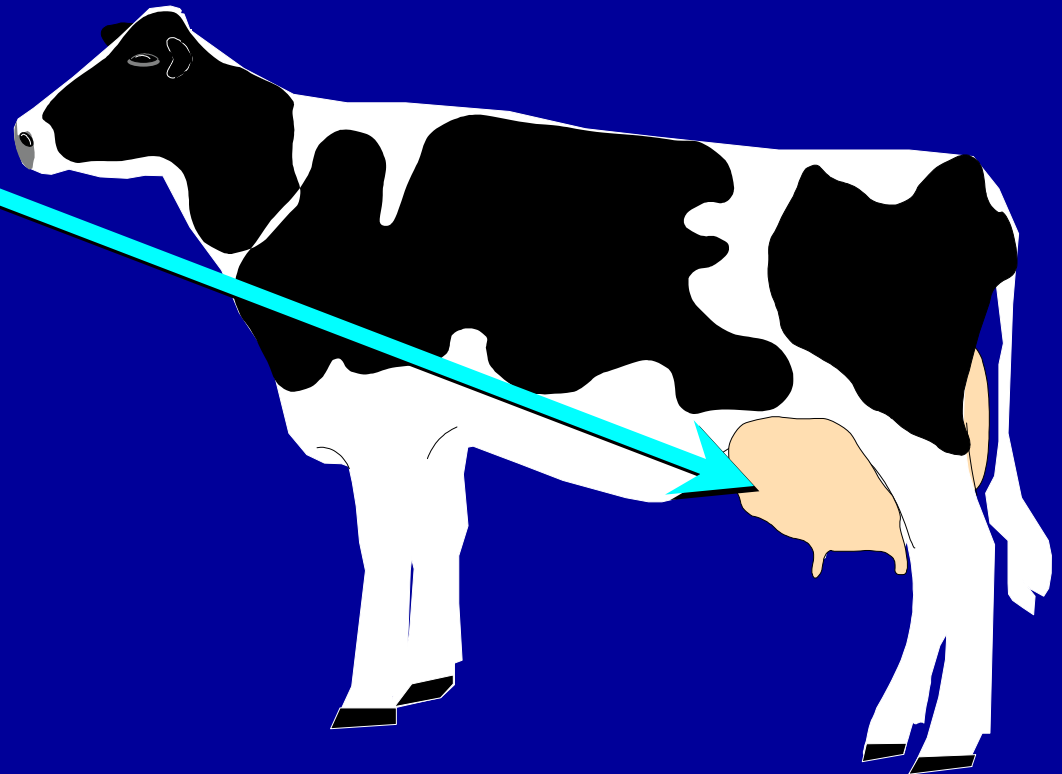
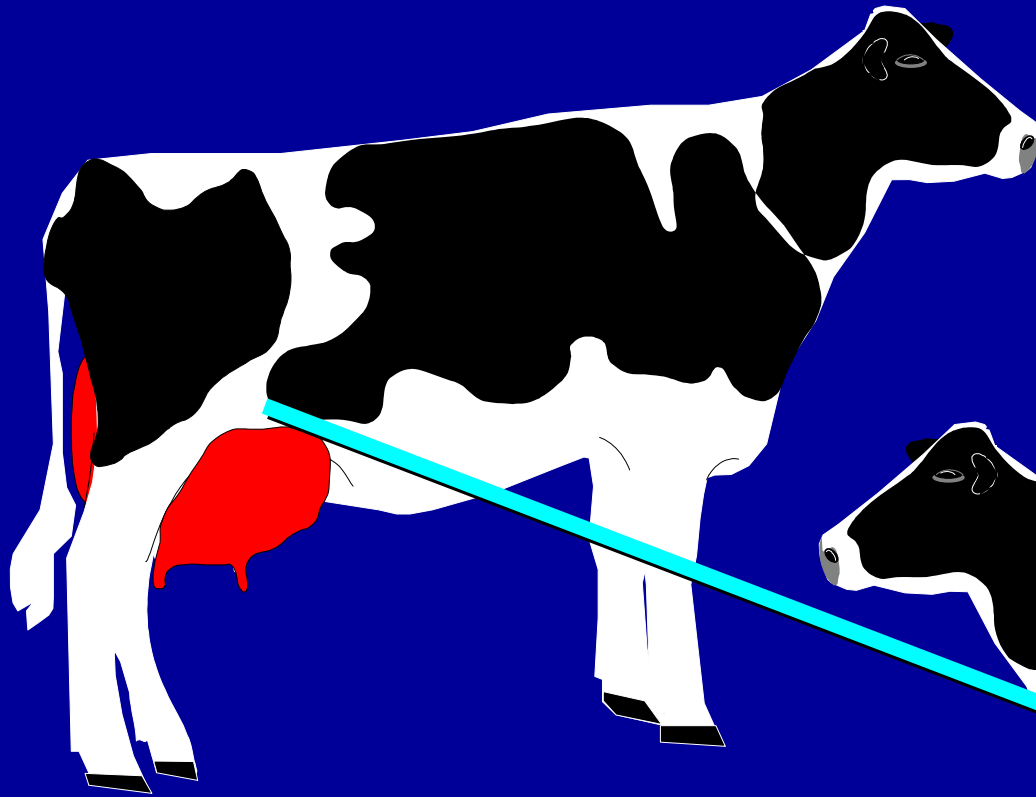
*Staphylococcus
aureus*

Comparison of Contagious and Environmental Mastitis



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Contagious Mastitis Spreads from Cow to Cow



Strep. agalactiae

Staph. aureus

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**Environmental Organisms
are Spread Primarily
Between Milking**

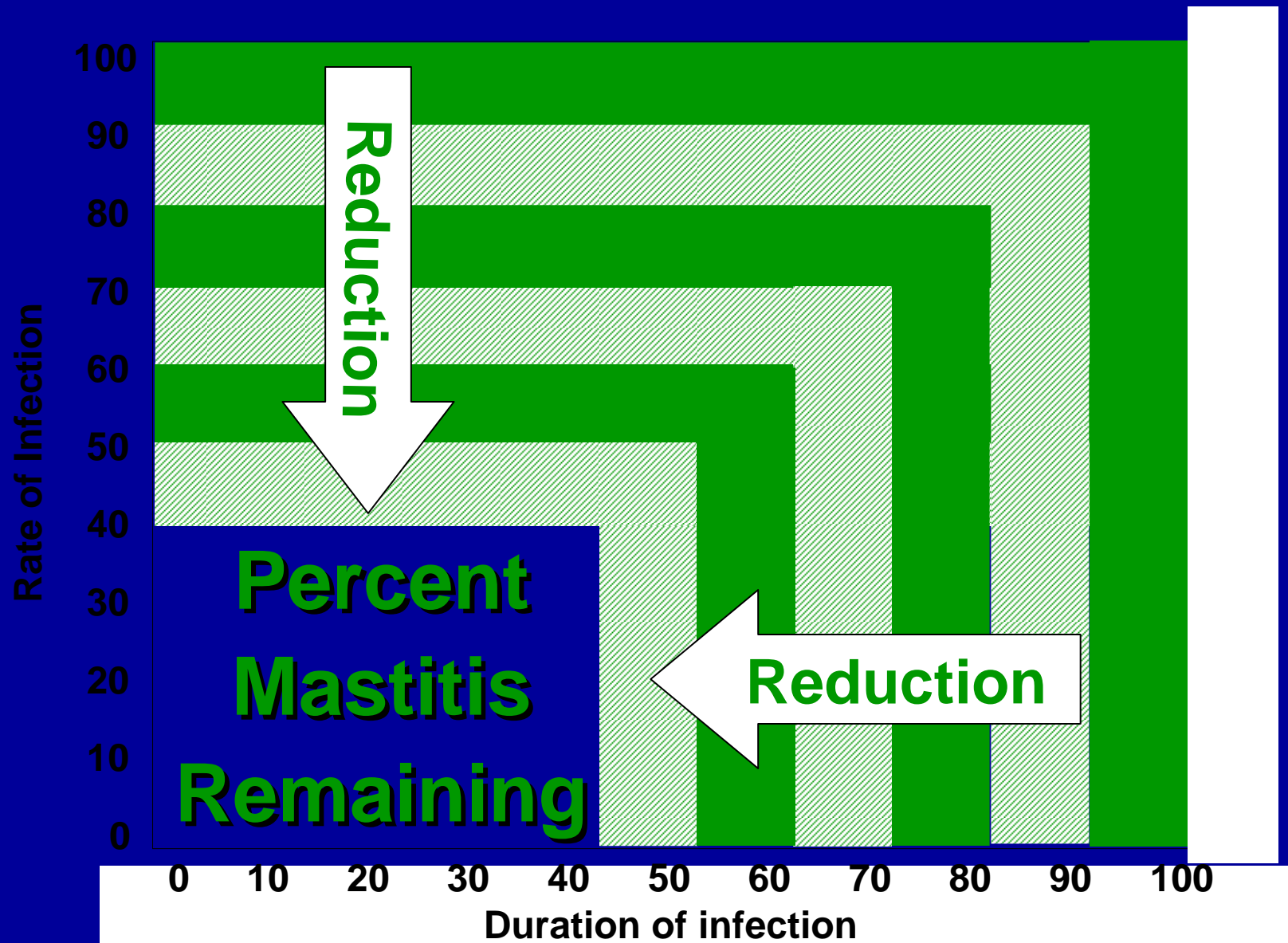


Figure 3. Effects of reducing rate and duration of infection on level of infection.

Prepared by: CDS, Laramie, WY; by Linda Wilson, consultant

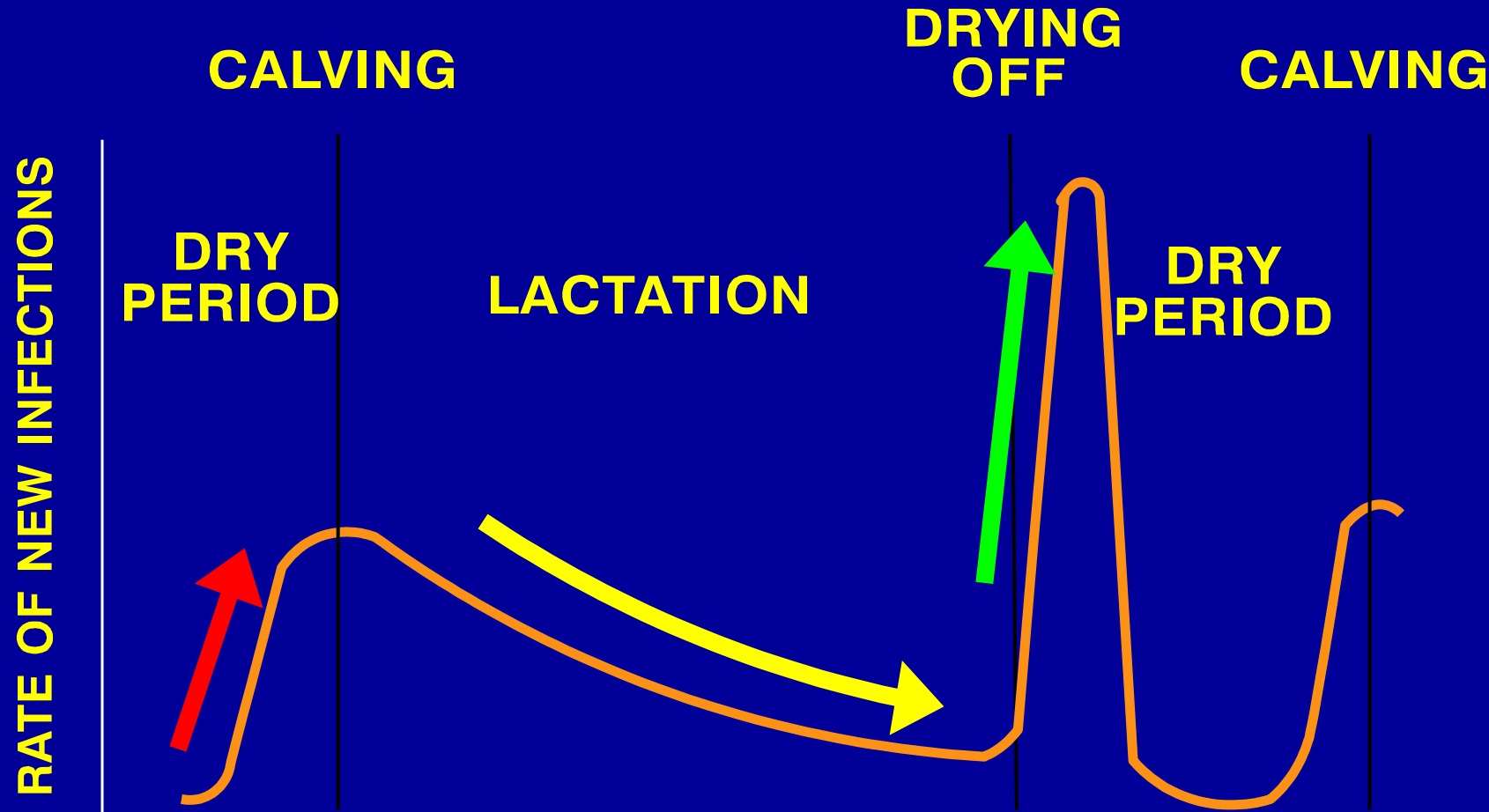








RELATIVE FREQUENCY OF NEW INFECTIONS DURING LACTATION AND THE DRY PERIOD



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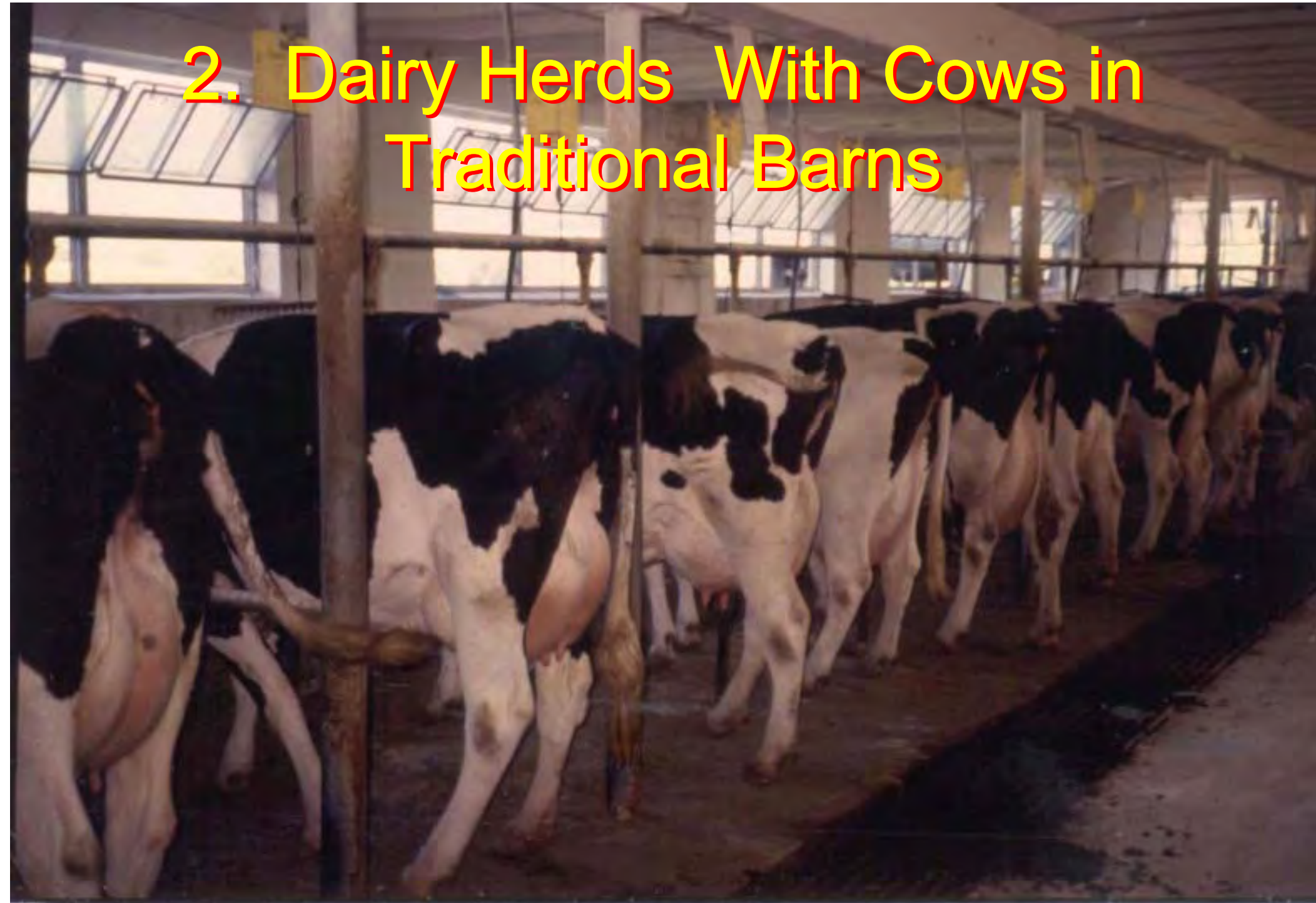


Mastitis Control Programs are Effective in:

1. Large Dairy Herds



2. Dairy Herds With Cows in Traditional Barns











Good Cow Milking Reduces Mastitis...

Are you following good milking
procedures?



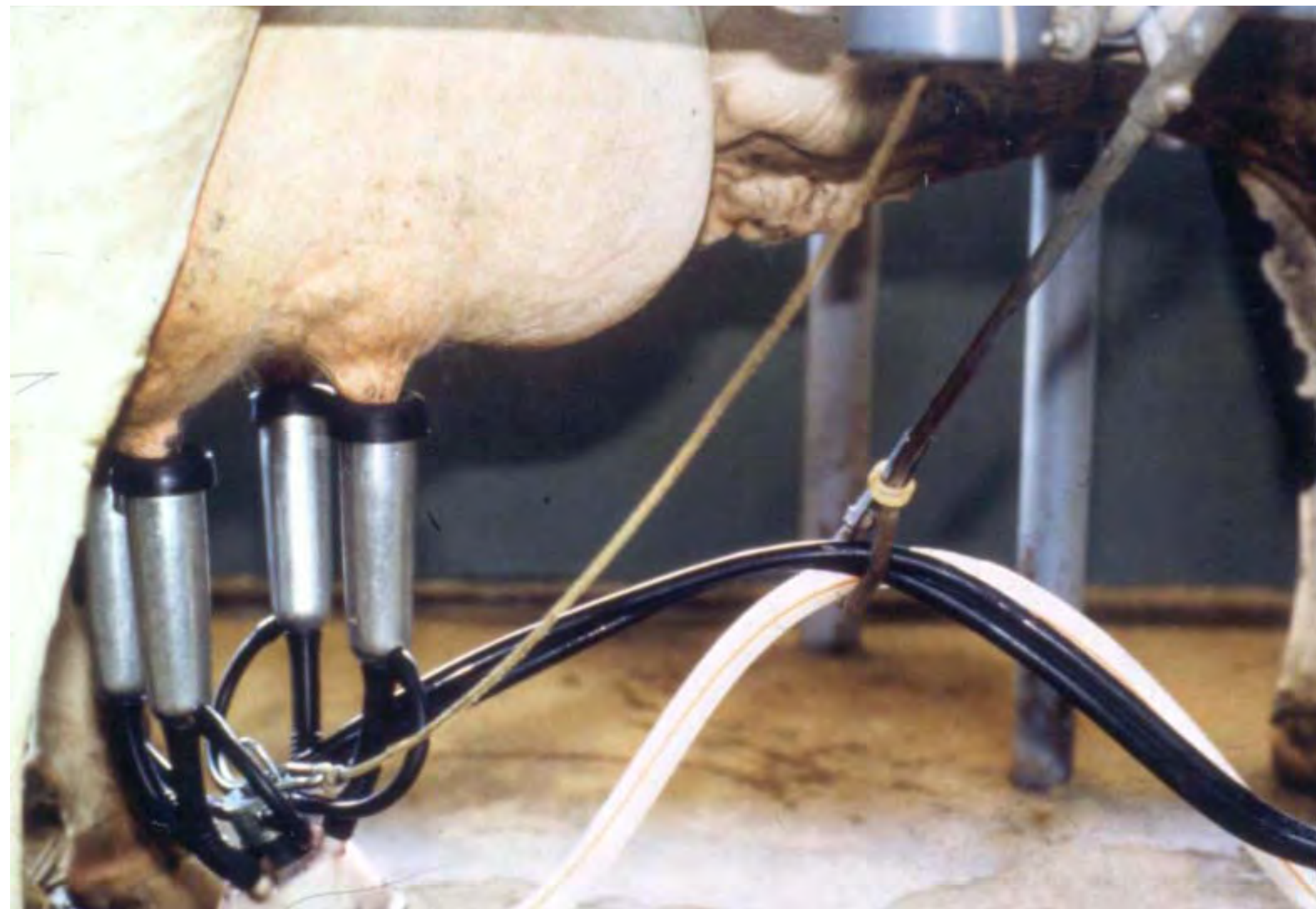


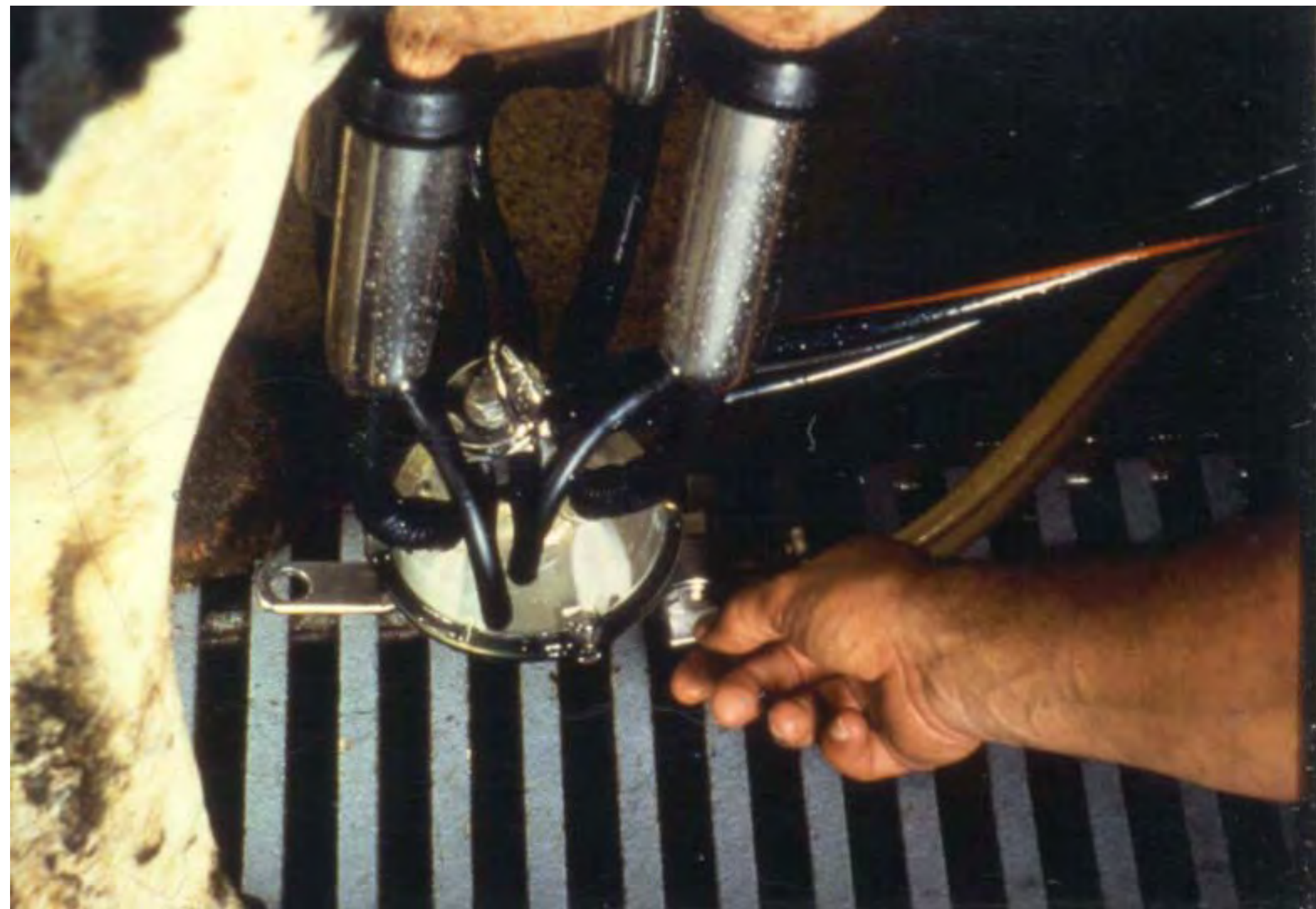

























Dipping Teat Cups Between Cows is of Little Value

A close-up photograph showing a person's hand holding a rectangular, light-colored paper milk filter. The filter is held vertically and shows signs of use, with some reddish-brown spots and a faint vertical line running down its center. The person holding the filter is wearing dark clothing. In the background, a tiled floor and a person's leg in dark pants and a shoe are visible.

**Inspect Milk Filters After Every
Milking**

A close-up photograph of a petri dish containing a red agar medium. In the upper left quadrant, there is a distinct, elongated, and somewhat irregular white bacterial colony. The rest of the agar surface is smooth and red. A small white rectangular label is positioned in the center of the dish.

S. uberis

Control of Environmental Mastitis

Environmental Organisms

- *Streptococcus uberis* is the Most Common Environmental Organism
- Coliforms Include *Escherichia coli*, *Klebsiella*, *Enterobacter*, *Citrobacter*, and *Serratia*



**Providing a Good Environment for
the Cow is the First Step in
Reducing Environmental Mastitis
in the Herd.**





Traditional Mastitis Control Methods are of Limited Value with Environmental Organisms Because Their Primary Means of Spread is Not During Milking















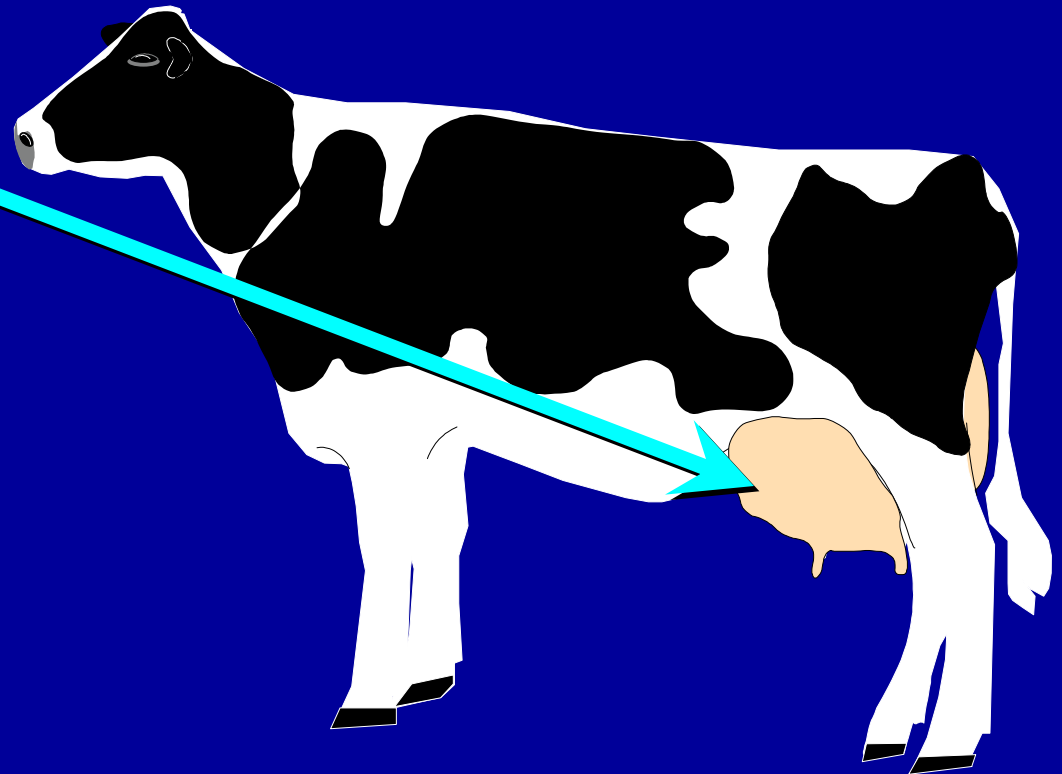
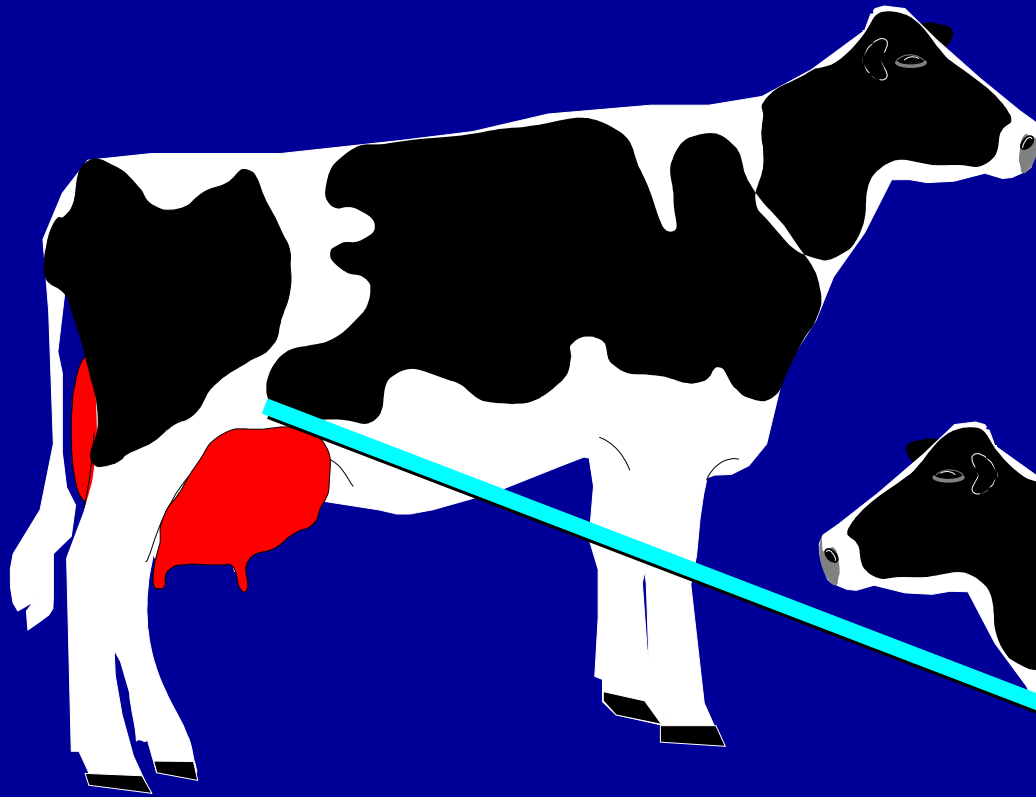


Eradication of Contagious Mastitis...

Is a Difficult Process but is Possible.

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Contagious Mastitis Spreads from Cow to Cow



Strep. agalactiae

Staph. aureus

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Control of *Streptococcus* *agalactiae* Mastitis























LACTATING COW



DISCARD MILK FOR
48 HOURS
AFTER LAST
TREATMENT

READ RESIDUE WARNING



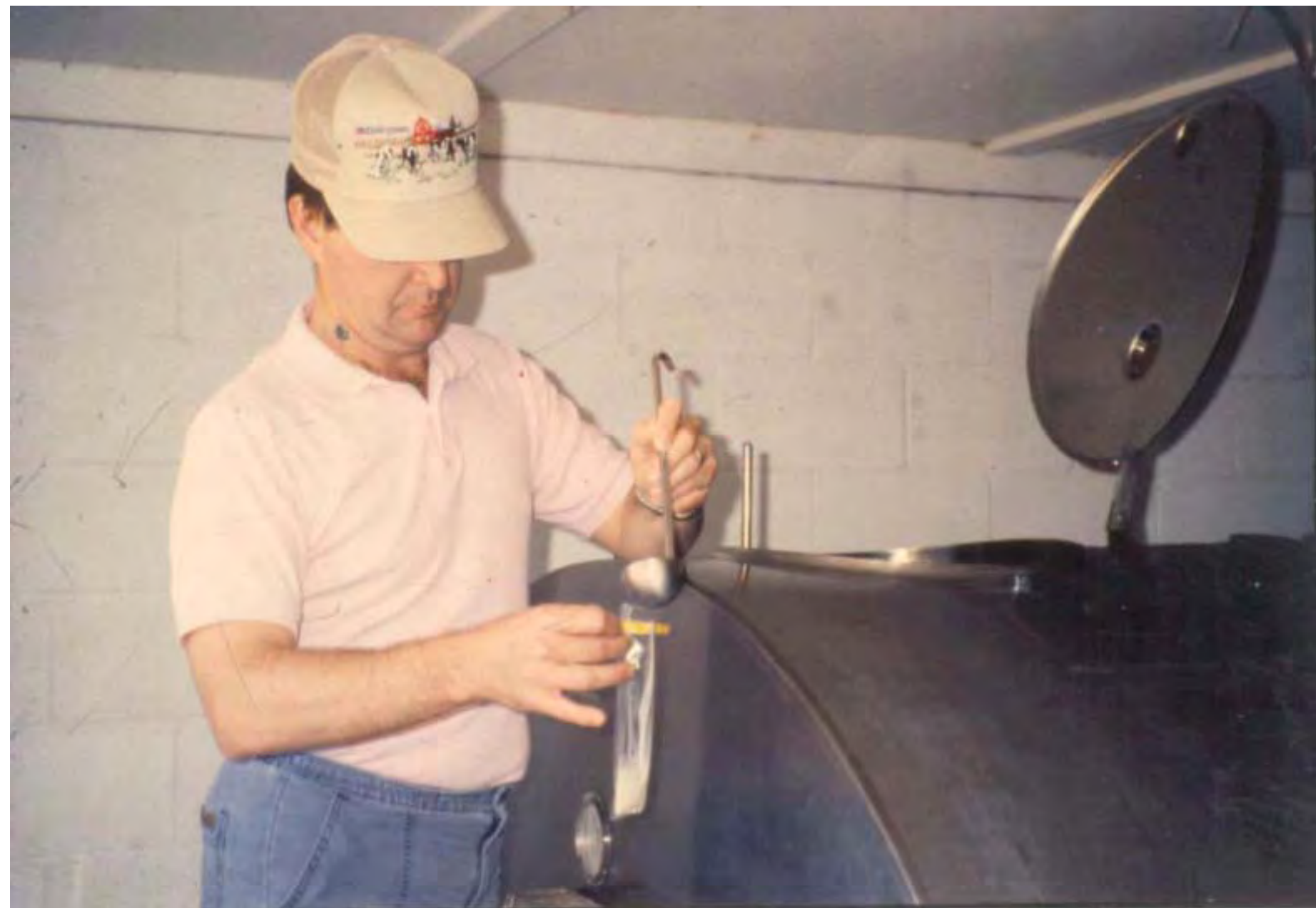
DO NOT SLAUGHTER
COW FOR
10 DAYS
AFTER LAST
TREATMENT

**Look for Other Cows Infected
With Other Organisms Such as
Nocardia, *Mycoplasma*, and
*Staphylococcus aureus***











Control of Staphylococcus aureus





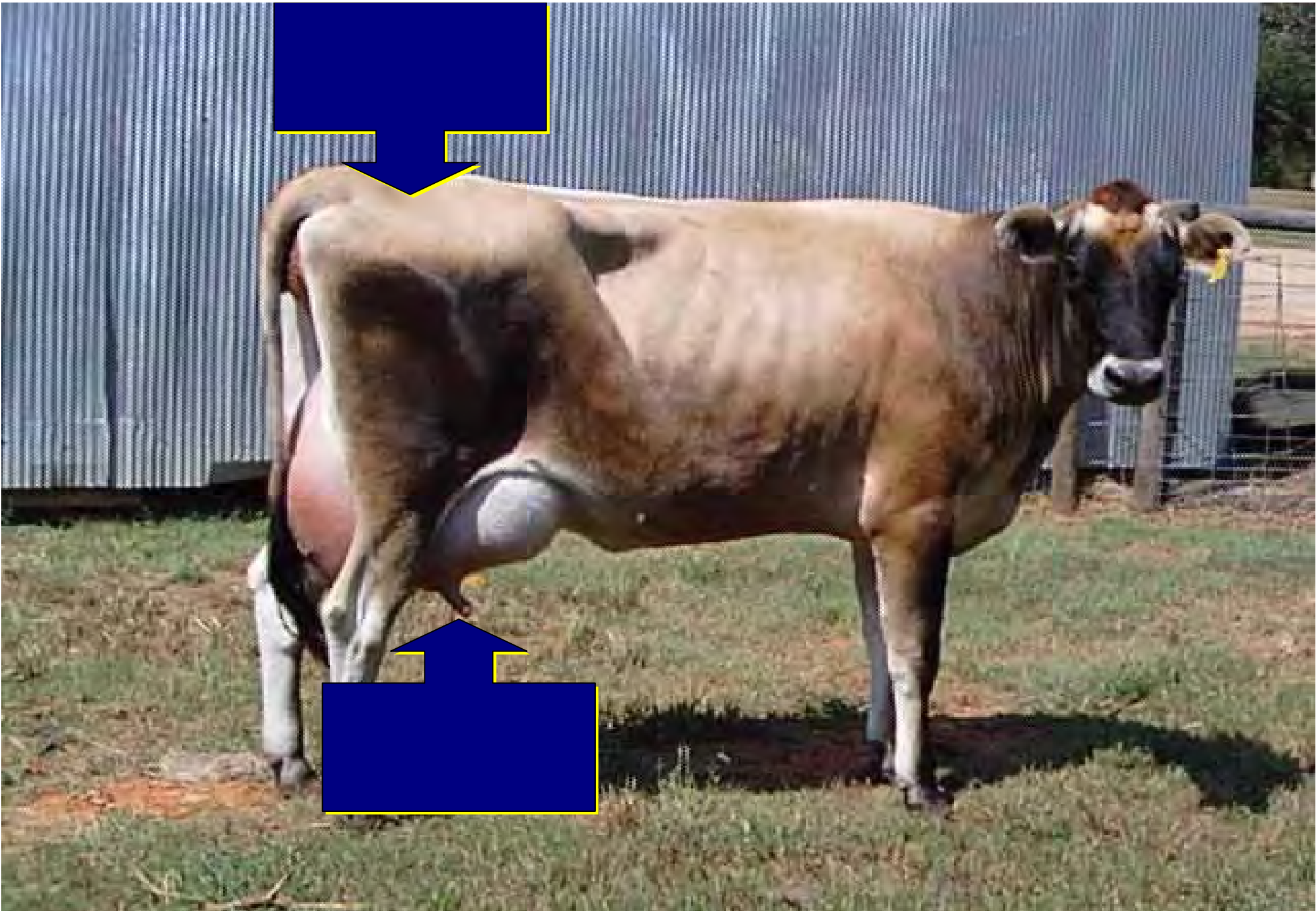




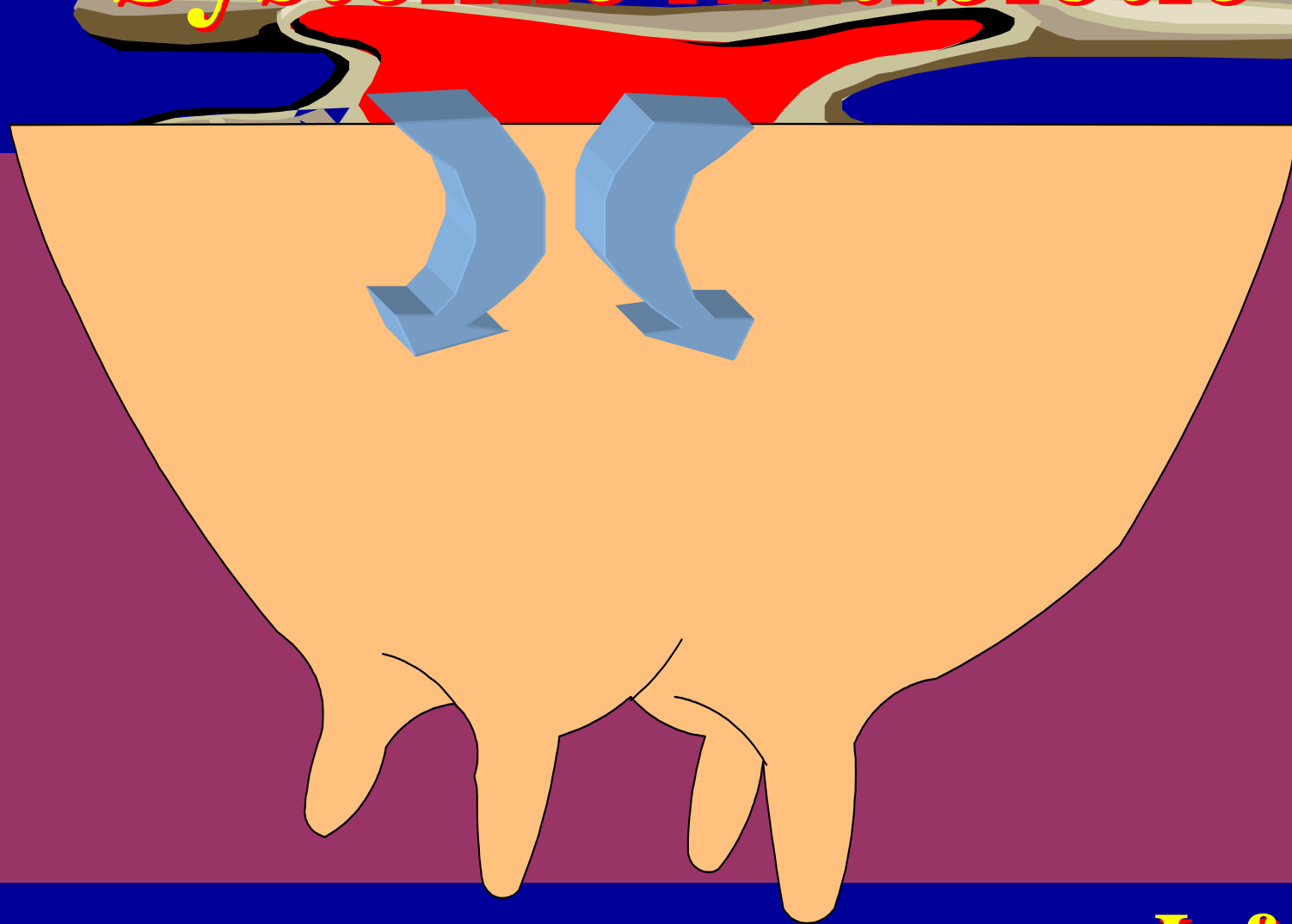


**Role of Therapy in Control of
Staphylococcus aureus Mastitis**





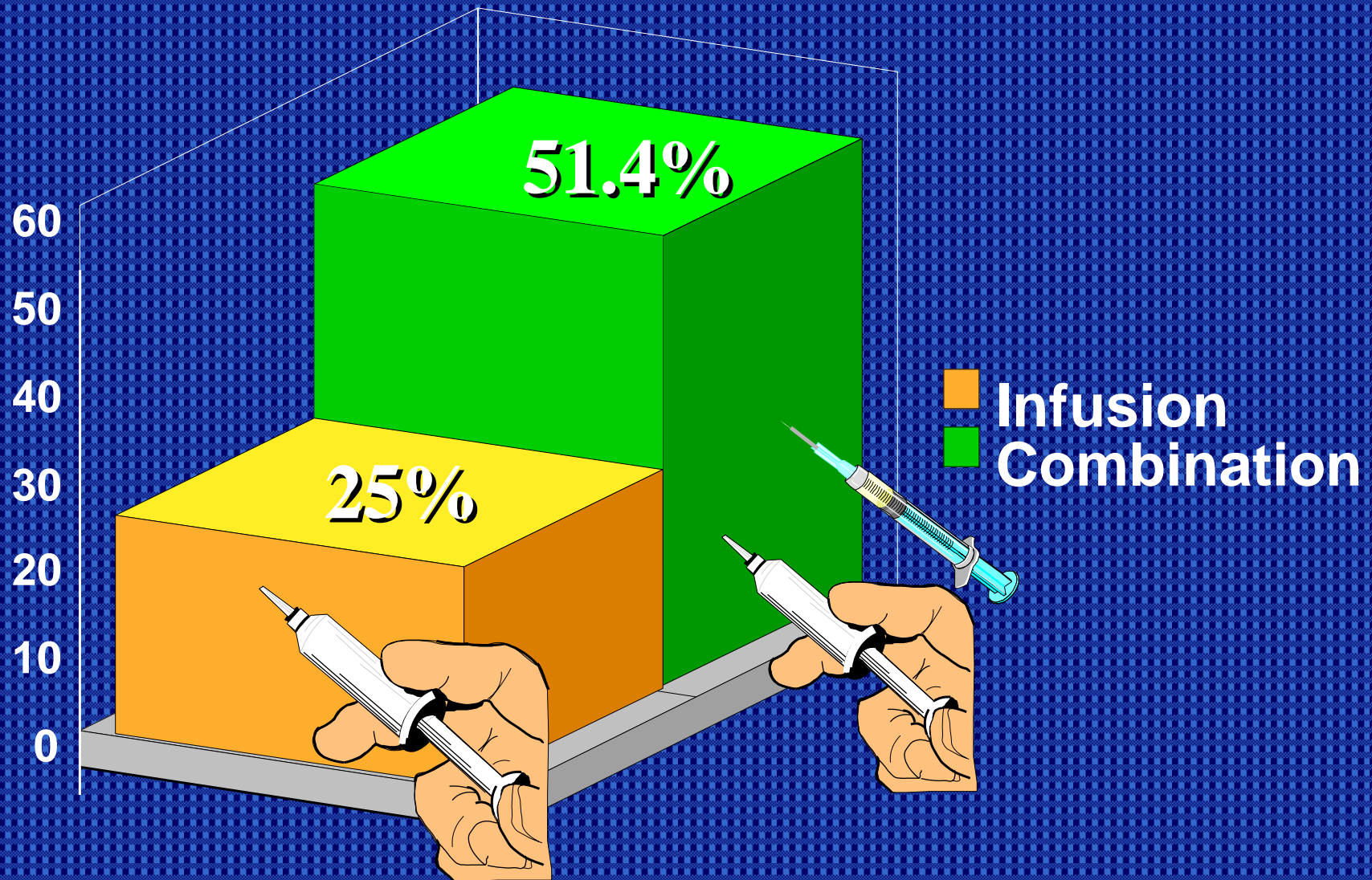
Systemic Antibiotic



**Infused
Antibiotic**

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Treatment of Staphylococcus aureus

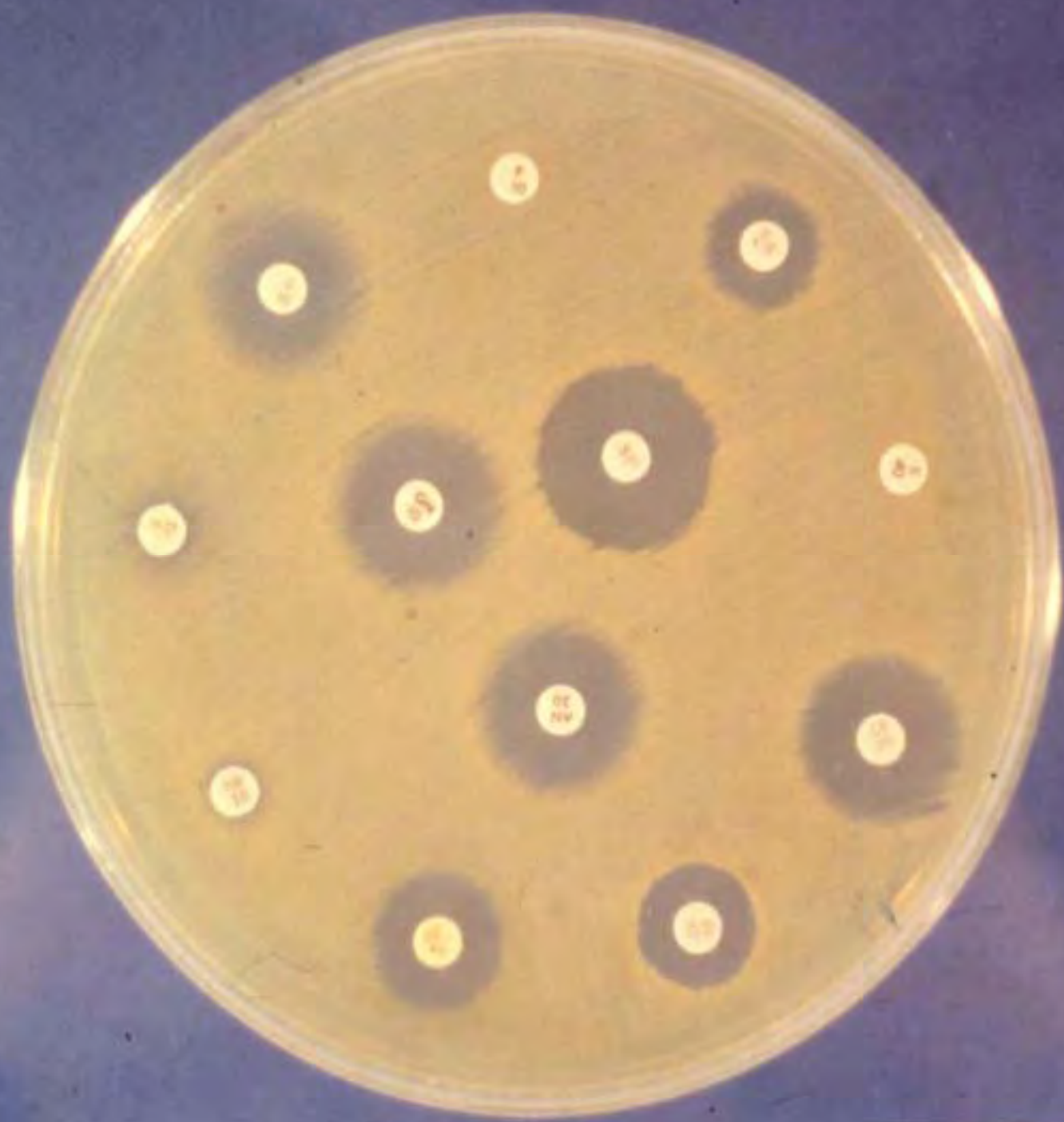


Staphylococcus aureus

Vaccination is of Value to:

- ✓ Prevent Infections
- ✓ Reduce Severity
- ✓ Cure Infections











Let's Review

Milk Quality

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To Improve Milk Quality...

- Monitor Bacteria and SCC in milk.
- Recognize the Problem.
- Take Appropriate Action.

Bacteria Counts ...

- Easy to Correct.
- Dirty Equipment.
- Improper Cleaning of Cows.
- Poor Cooling.

High SCC Counts...

- Indicate an infection in the udder.
- Subclinical Mastitis is the **GREATEST PROBLEM.**
- Identify the Type of Mastitis.
- Develop a Mastitis Control Program and **FOLLOW IT.**
- Strive for a count of less than 200,000 **SCC/ML.**

***The Future of the Dairy Industry
In Kosovo
Depends on the Ability of the
DAIRY FARMER
To Produce High Quality Milk.***

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The End

